

# Learning zone

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## Needlestick and sharps injuries: practice update

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### Abstract

Member states of the European Union have until May 11 2013 to implement the Council Directive 2010/32/EU *Implementing the Framework Agreement on Prevention from Sharps Injuries in the Hospital and Healthcare Sector*. The aim of this legislation is to achieve a safe working environment and prevent injuries to healthcare professionals caused by all medical sharps, including needlesticks. This article examines the issues surrounding needlestick and sharps injuries, including risk assessment and prevention, information provision, raising awareness, use of safety devices, training and reporting procedures.

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Blood-borne viruses, health and safety, hepatitis, infection control and prevention, needlestick injuries, sharps injuries

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### Aims and intended learning outcomes

The aim of this article is to increase awareness of the incidence and consequences of needlestick injuries (NSIs) and sharps injuries among healthcare professionals. Legislation to improve safety and reduce NSIs and sharps injuries are also discussed. After reading this article and completing the time out activities you should be able to:

- ▶ Recognise the risk factors associated with NSIs and sharps injuries, including types of device and particular procedures.
- ▶ Identify the principles of safe handling and disposal of sharps.
- ▶ Outline best practice in relation to reporting of NSIs and sharps injuries.
- ▶ Describe the actions that need to be taken following NSIs and sharps injuries.
- ▶ Discuss legislation to improve safety and reduce NSIs and sharps injuries in the healthcare setting.

### Introduction

On evaluating the safety risks to staff in NHS hospitals, the National Audit Office (2003) identified that 17% of accidents reported were associated with needlesticks or sharps. NSIs and sharps injuries are common among healthcare professionals. Following a survey of more than 4,000 nurses carried out by the Royal College of Nursing (RCN) (2008), it was estimated that 48% of nurses had received an NSI or sharps injury. Inoculation injuries may be subdivided into two categories: those resulting from percutaneous exposure and those resulting from mucocutaneous exposure.

Percutaneous exposure occurs as a result of a break in the skin caused by a needlestick or sharp contaminated with blood or body fluid. Mucocutaneous exposure occurs when body fluids come into contact with open wounds, non-intact skin such as that found in eczema, or mucous membranes such as the mouth and eyes (Haiduvan *et al* 1999). There are more than 20 blood-borne pathogens that can be transmitted following an NSI or sharps injury; the most common are hepatitis B, hepatitis C and human immunodeficiency virus (HIV).

### Complete time out activities 1 and 2

NSIs and sharps injuries can transmit disease and therefore are a significant occupational hazard for healthcare professionals. At present there is no national surveillance system in place to monitor healthcare-associated NSIs and sharps injuries in the UK. However, since 1997 all cases of occupational exposure to hepatitis B, hepatitis C and HIV, and all incidents where post-exposure prophylaxis for HIV has been commenced as a result of suspected inoculation, must be reported to the Health Protection Agency (HPA) (Centers for Disease Control and Prevention (CDC) 1997).

One of the largest surveillance systems being introduced worldwide is EPINet (Exposure Prevention Information Network). EPINet provides a standardised method for recording NSIs and mucocutaneous exposure, therefore enabling identification of how future injuries of this nature can be prevented. The RCN has undertaken studies using this system (May and Churchill 2001).

Between 1997 and 2009, there were 17 recorded cases of healthcare professionals developing (seroconverting) hepatitis C in England following percutaneous exposure to a patient infected with the virus (NHS Employers 2005). Five cases of HIV seroconversions resulting from percutaneous exposure have been reported in healthcare professionals in the UK. However, there have been no cases of seroconversion to HIV from percutaneous exposure since 1999 (HPA 2008).

### Costs related to needlestick and sharps injuries

Treatment costs and lost productivity as a result of NSIs and sharps injuries may place added financial strain on the NHS. Financial costs associated with initial treatment of a staff nurse following exposure to a patient infected with hepatitis B, hepatitis C and

HIV have been calculated (Adams and Elliott 2006a). The costs were estimated at £1,540 for infection with hepatitis B, £235 for infection with hepatitis C and £938 for infection with HIV. These costs include serological investigations, post-exposure prophylaxis, healthcare consultations and assessments, and time associated with attending occupational health clinic appointments (Adams and Elliott 2006a). Furthermore, the financial costs associated with the initial treatment of a staff nurse who has seroconverted to hepatitis B, hepatitis C or HIV following an NSI were also determined (Adams and Elliott 2006b). The approximate financial costs associated with seroconversion to hepatitis B, hepatitis C or HIV following an NSI were £607 for hepatitis B, £7,298 for hepatitis C and £938 for HIV. Activities that incurred these costs included post-exposure prophylaxis, serological investigations, healthcare consultations or assessments and time associated with attending clinic appointments during the initial six to 12 months of therapy.

A study of the costs associated with the implementation of safety devices to reduce the risk of NSIs was undertaken in 18 hospitals in Sweden (Glenngård and Persson 2009). The study demonstrated that the increased cost of the safety device was offset by the reduction costs associated with the investigation and treatment of a potential NSI.

### Psychological implications

The psychological effect of an NSI or sharps injury on a healthcare professional can be significant. The individual may find waiting for test results particularly distressing. Costigliola *et al* (2012) questioned 634 nurses from western Europe and Russia who had experienced an NSI associated with diabetes injections. They identified emotional responses following such an injury, including depression, crying spells, tension in the family, relationship issues, panic attacks, excessive anxiety and inability to work.

Many NSIs and sharps injuries are preventable and employers have a duty to ensure the safety of their employees. Member states of the European Union have until May 11 2013 to implement the Council Directive 2010/32/EU *Implementing the Framework Agreement on Prevention from Sharps Injuries in the Hospital and Healthcare Sector*. The main aims of the directive are to:

- ▶ Achieve the safest possible working environment for employees and patients.
- ▶ Prevent injuries to healthcare professionals as a result of NSIs and sharps injuries.
- ▶ Set up an integrated approach to addressing the issue of sharps injuries, which includes establishing policies on risk assessment and prevention, training, information provision, raising awareness and monitoring, including the provision of safety medical devices.

### Key legislation

All member states of the EU will need to implement the Council Directive 2010/32/EU to prevent injuries and infections to healthcare professionals in both private and public domains, including prisons, as a result of NSIs and sharps injuries. Key requirements that need to be implemented include:

- ▶ Risk assessment – is there risk of exposure to a blood-borne pathogen from NSIs and sharps injuries? Can the risk be eliminated or minimised?
- ▶ Risk elimination and prevention – undertake a review of practice. Eliminate unnecessary use of sharps. Identify whether the risk of exposure can be reduced by using safety devices, improving education and awareness, reviewing staffing levels, and ensuring personal protective equipment and appropriate sharps disposal systems are available at the point of use. Ensure the organisation has developed an occupational exposure policy.
- ▶ Training – incorporate use, safe handling and disposal of sharps procedures, improve occupational exposure awareness such as risks associated with exposure to blood and body fluid, recognise the importance of hepatitis B immunisation and encourage occupational exposure reporting.
- ▶ Information – inoculation injuries should be reported promptly and appropriately, and risks identified following a root cause analysis of each case.
- ▶ Raising awareness and monitoring – employers are responsible for ensuring that all staff are aware of the risks associated with occupational exposure from inoculation injuries. Furthermore, health monitoring and vaccination should be provided where available.

The directive requires that healthcare providers undertake all that is reasonably practical to protect healthcare professionals and other staff from harm. Failure to

implement the directive will be seen as a criminal offence.

Demonstrating an understanding of the factors that result in NSIs and sharps injuries and how the EU directive can be used to address these issues will help to create a safe working environment for healthcare professionals.

### Factors influencing needlestick and sharps injuries

NSIs and sharps injuries may occur for a variety of reasons, including the types of device used and procedures undertaken, lack of training on safe use and disposal of needles and sharps, and lack of knowledge of the consequences of such injuries. It is important to understand these areas to ascertain how best to reduce occupationally acquired NSIs and sharps injuries in the healthcare setting.

**Complete time out activity 3**

### Types of device

Jagger *et al* (1988) reviewed 326 NSIs resulting from hollow bore needles over ten months in one university hospital in Virginia in the United States (US). Devices commonly associated with hollow bore NSIs were noted and are shown in Table 1. The device associated with the highest percentage of injuries (35%) was identified as the disposable syringe and needle. However, when the data are corrected to take account of the number of each device purchased for use and then compared to the number of devices in other sharps categories, the disposable needle and syringe were identified as being associated with the lowest rate of injury (6.9 NSIs per 100,000 devices purchased).

### Safety devices

There are two main types of features used in the design of safety devices. These include passive safety devices, where no additional actions are required by the user to activate the safety feature, and active safety devices where the user is required to activate the safety feature (CDC 2008). The main features of a safety device have been identified by Strauss and the WISE Consensus Group (2012) (Box 1). It is essential that these devices are evaluated appropriately before use to ensure that they meet user requirements, do not interfere with their original use and function, and reduce the risk of NSIs (Adams and Elliott 2003). Examples of safety engineered devices are shown in Figure 1.



**1** A colleague has received an NSI following disposal of a needlestick in the sharps bin. What blood-borne pathogens might the person be exposed to?

**2** Does your employer collect data on NSIs and sharps injuries? If you are not sure then try to find out where you can access this information.

**3** Identify the type of sharps devices you use in your area of practice. Do you use any safety devices? Where standard devices are used, are you aware of the risks associated with these devices and are they reviewed regularly?

Four key factors should be examined when evaluating a safety device. These are: safety, usability, compatibility with need and ensuring the device does not cause other concerns such as splatter on activation (Adams and Elliott 2003, 2006c). To assess product safety a systematic evaluation should be undertaken. Users of the device should also evaluate the product in the clinical setting (Adams

and Elliott 2003). Safety devices are only as good as the operator using them. If the operator fails to activate a safety feature for any reason then the device is not protected and the healthcare worker is at risk from an NSI or sharps injury.

Fahey and Henderson (1999) reported that one reason why these devices sometimes fail to reduce NSIs was that they were not accepted by healthcare professionals. This was because they had not received comprehensive training in their use and their implementation in the clinical area was poorly managed. Therefore it is essential that healthcare professionals are involved in the selection and evaluation of safety devices.

Several studies have demonstrated the effectiveness of safety devices in reducing NSIs and sharps injuries. Wolfrum (1994) evaluated a needle-free IV system for all inpatients at a 394-bed hospital in the US. A 68% reduction in NSIs was noted following introduction of the system. The CDC (1997) evaluated three types of safety device designed to reduce the risk of phlebotomy-associated inoculation injuries in healthcare professionals. A 23-76% reduction in NSIs was identified when safety devices were used, compared with routine products. In addition, healthcare professionals found the devices relatively easy to use. Chen *et al* (2000) evaluated a safety winged steel needle blood collection set at a 1,100-bed hospital between 1998 and 1999. The study demonstrated a 59% reduction in reported NSIs.

A four-year study was undertaken in the UK to evaluate the effect of the introduction of an educational strategy and a range of safety hypodermic needle devices on the number of NSIs. Following the enhanced educational strategy, NSIs were reduced by 18%. However, when only standard training was provided, the number of NSIs increased (Adams and Elliott 2006c). The subsequent introduction of three safety needle devices with concomitant training resulted in a significant reduction (70%) in reported NSIs. The Health and Safety Executive (2012) has recently undertaken a systematic review of the efficacy of safety devices and their effect on NSIs and sharps injuries. The review found that there was sufficient evidence to support the use of safety devices to reduce the incidence of sharps injuries among healthcare workers in the UK.

Following the introduction of any safety device it is important to ensure that continuing product reviews are undertaken. This will

**TABLE 1**  
**Percentage and rate of needlestick injuries caused by hollow bore needle devices**

Device	%	Rate*
Disposable syringe and needle	35	6.9
Intravenous (IV) tubing and needle assemblies	26	36.7
Pre-filled syringe cartridges	12	8.3
Winged steel IV sets	7	18.2
Vacuum tube phlebotomy assemblies	5	25.4
IV stylets	2	18.4
Other devices	13	N/A

\*Rate per 100,000 devices purchased (Jagger *et al* 1988)

**BOX 1**

**Main features of safety devices**

**During use:**

- ▶ Can be activated using a one-handed technique or routine use of the device causes the safety mechanism to deploy automatically (passively) immediately after the sharp has been used.
- ▶ Does not obstruct vision of the tip of the sharp.
- ▶ Offers a good view of any aspirated fluid.
- ▶ Does not require more time to use than a non-safety device.
- ▶ Works appropriately with a wide variety of hand sizes.
- ▶ Easy to handle while wearing gloves.
- ▶ Works with all required syringe and needle sizes.
- ▶ Provides a better alternative to traditional recapping.

**After use:**

- ▶ Clear and unmistakable change (audible and/or visible) occurs when the safety feature is activated.
- ▶ Operates reliably.
- ▶ Exposed sharp is permanently blunted or covered after use and remains so until and after disposal.
- ▶ No more difficult to dispose of after use than non-safety devices.

These criteria represent optimal target features, which may not be achievable in every device; they do not represent an exhaustive list and may evolve over time.

(Strauss and WISE Consensus Group 2012)

**FIGURE 1**

**Examples of safety engineered devices**

V-LINK Luer-activated Device (Baxter)



Hypodermic Needle-Pro Device (Jelco)



Monoject Safety Syringe (Covidien)



Nexiva Closed Intravenous Catheter System (Becton Dickinson)



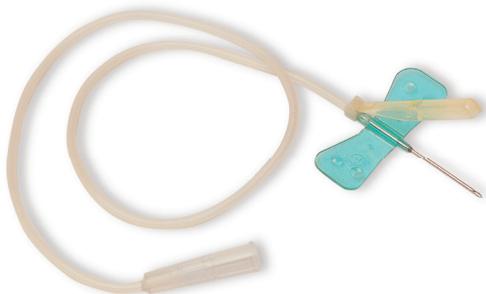
Vacutainer Eclipse Blood Collection Needle (Becton Dickinson)



Autoshield Pen Safety Needle (Becton Dickinson)



Surshield Safety Winged Blood Collection Set (Terumo)

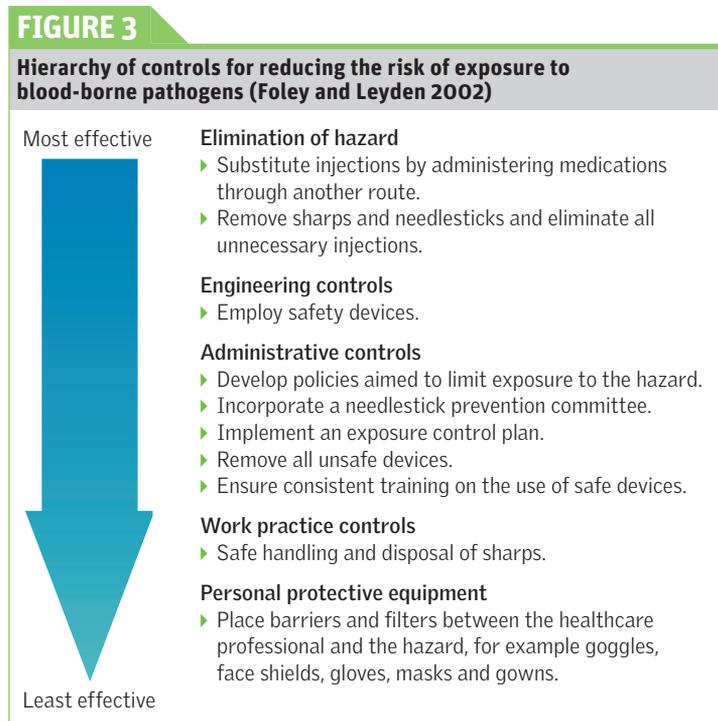
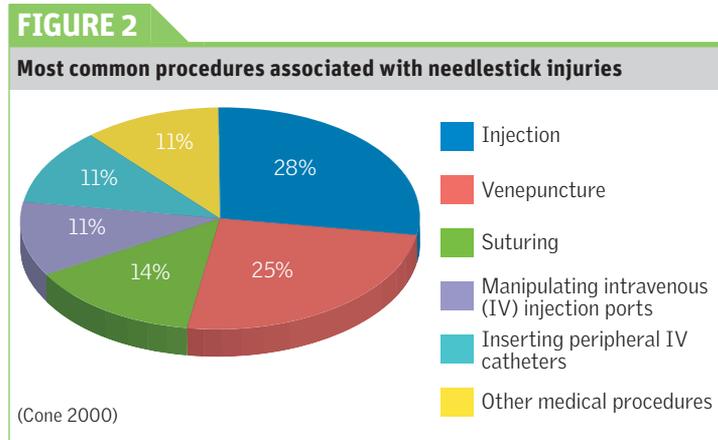


Retractable Disposable Sterile Scalpel (Swann Morton)



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help to establish whether there are any risks associated with using the device. Adams and Elliott (2003) identified that some safety devices may cause splatter on activation. Roff (2011) also demonstrated that the activation of benchtop-activated devices (devices that may be activated using surfaces such as tables or bedside lockers rather than by the operator's hand) may cause environmental contamination, which can accumulate on the surface near where the device has been activated. Training is essential to ensure that healthcare professionals are aware of the risks associated with particular devices.



### Types of procedure

Cone (2000) identified the procedures most frequently associated with NSIs (Figure 2). Giving an injection was responsible for the majority of NSIs. In other studies, it has been reported that 13-62% of all NSIs are associated with venesection (McGeer *et al* 1990, McCormick *et al* 1991). Phlebotomy is one of the most commonly performed procedures and can be undertaken by phlebotomists, doctors or nurses. Gaffney *et al* (1992) found that 72% of doctors had acquired an NSI while performing phlebotomy during one six-month period, with less than 5% of these injuries being reported. This is supported by the Health Protection Agency's (2008) surveillance project *Eye of the Needle*, which reported that percutaneous injuries involving hollow bore needles following blood sampling remain the most commonly reported occupational exposure in the healthcare setting (HPA 2008).

Cardo *et al* (1997) identified that the risk of transmission of infection following NSIs or sharps injuries may be affected by:

- ▶ Depth of injury.
- ▶ Type of sharp used – hollow bore needles are associated with increased risk, although needles used for subcutaneous injection also present a risk.
- ▶ The amount of blood or body fluid inoculated.
- ▶ Whether the device was previously in the patient's vein or artery.
- ▶ How infectious the patient is at the time of the injury.

Healthcare workers at increased risk of acquiring NSIs or sharps injuries include doctors, nurses, phlebotomists and domestic service staff, such as cleaners, porters and waste removal teams. Data from the HPA (2008) identified that the significant occupational exposures to blood-borne viruses reported were most frequently associated with medical and dental professions (46%) and nurses (44%). In the UK, almost 40% of NSIs and sharps injuries occurred to someone other than the original user of the device (May and Churchill 2001). Injuries most frequently occurred when cleaning equipment, assisting in procedures and during waste collection and environmental cleaning (Cone 2000).

### Complete time out activity 4

### Safe use and disposal of needles and sharps

Foley and Leyden (2002) have identified a hierarchy of controls to reduce the risk of

exposure to blood-borne pathogens (Figure 3). The priority is to eliminate and reduce the use of needles and other sharps where possible. It is important to isolate any hazards and thereby protect others exposed to sharps, for example through the use of safety devices. Regardless of whether a safety device is available, safe work practices are essential to reduce NSIs and sharps injuries in the workplace. The RCN (2012) has published guidance for nursing staff on the safe use and disposal of sharps (Box 2).

### Knowledge about the consequences of needlestick and sharps injuries

The lifespan of blood-borne viruses outside the body is significant. Hepatitis B virus may survive for up to one week (CDC 2009a) and hepatitis C virus for up to four days (CDC 2009b). Therefore, NSIs and sharps injuries from what may be considered an 'old' device, may still lead to the transfer of blood-borne viruses. HIV is not thought to survive well outside of the body (CDC 2010).

It is important that all healthcare professionals are educated about the risks associated with NSIs and sharps injuries both from a recently used device and one where the history of use is unknown. Healthcare managers need to ensure that staff adhere to the principles of safe handling and disposal of sharps as outlined in Box 2.

It is important to remember that it is not only healthcare staff who are at risk of injury. Studies have highlighted the risk of transmission of blood-borne viruses, such as hepatitis B (Shaw *et al* 1986), hepatitis C (Communicable Disease Report 1995, Esteban *et al* 1996, Cody *et al* 2002, Ross *et al* 2002) and HIV (Ciesielski *et al* 1992, Lot *et al* 1999, Goujon *et al* 2000) from healthcare professionals to patients. Therefore raising awareness among healthcare professionals of the consequences of NSIs and sharps injuries to themselves and patients is essential.

### Pre-exposure vaccination

Pre-exposure vaccination to hepatitis B should be considered for all healthcare professionals who are at risk of exposure to the virus from contact with blood, body fluids or tissues (Department of Health (DH) 2006). Around 78-88% of healthcare professionals have received vaccination against hepatitis B (Nee *et al* 1995, Gyawali *et al* 1998). Nee *et al* (1995) examined the reluctance of members

of the British Association for Accident and Emergency to have the hepatitis B vaccination. Factors included: perceived low risk of seroconversion; it was deemed sufficient to take universal precautions during invasive procedures; seroconversion rates of hepatitis B in the UK were so low that immunisation was deemed unnecessary; and personal choice.

### Under-reporting

It has been highlighted in several reports that the incidence of under-reporting of NSIs and sharps injuries is high. In one small study involving 84 healthcare staff in Birmingham, including doctors, nurses and phlebotomists, 65% of those questioned had not reported some or all occupational exposures resulting from NSIs or sharps injuries (Dobie *et al* 2002). In a study of 300 healthcare professionals, 80% of staff were aware that NSIs and sharps injuries should be reported. However, only 51% of those affected had reported all needlestick injuries (Elmiyeh *et al* 2004).

Under-reporting of NSIs or sharps injuries may occur for several reasons, for example staff finding the reporting procedure to be time consuming, staff being too busy, poor follow-up procedures, staff underestimating the risks associated with contaminated needlesticks or sharps, and fear that reporting might have negative repercussions for them professionally (Haiduven *et al* 1999, Costigliola *et al* 2012).

### BOX 2

#### Principles of safe handling and disposal of sharps

- ▶ Handling of sharps is kept to a minimum.
- ▶ Syringes or needles are not dismantled by hand and are disposed of as a single unit straight into a sharps container for disposal.
- ▶ Sharps containers are readily available as close as possible to the point of use (sharps trays with integral sharps boxes are a useful resource).
- ▶ Needles are never re-sheathed or recapped.
- ▶ Needles are not broken or bent before use or disposal.
- ▶ Arrangements should be in place to ensure the safe disposal and transport of sharps used in a community setting such as the patient's home.
- ▶ All sharps containers should conform to UN standard 3291 and British Standard 7320.
- ▶ Sharps containers are not filled to more than two thirds.
- ▶ Sharps boxes are signed on assembly and disposal.
- ▶ Sharps bins are stored safely away from the public and out of reach of children.
- ▶ Staff should report sharps injuries in line with local reporting procedures and policies.
- ▶ Staff should attend training on the safe use of sharps and safety engineered devices.

(Royal College of Nursing 2012)



**4** Imagine you are about to give an intramuscular injection to a patient. Think about the safety issues that you need to be aware of and identify five key principles that should be followed when handling and disposing of the syringe and needle.

**5** Locate your local policy for occupational exposure as a result of NSIs and sharps injuries. Familiarise yourself with procedures following such injuries. Discuss with a colleague the measures that should be taken following percutaneous and mucocutaneous exposure to blood and body fluids.

To improve reporting of such incidents, staff should be educated about the risks associated with these injuries and should be aware of local reporting procedures.

## Complete time out activity 5

As identified, there is a lack of evidence on the actual number of NSIs and sharps injuries (NHS Employers 2005). Employers have a responsibility to report any exposures to hepatitis B, hepatitis C or HIV to the Health and Safety Executive (HSE) under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (HSE 1995). The

HSE is a national independent regulator for work-related health, safety and illness issues.

## Measures to be taken following needlestick and sharps injuries

Healthcare professionals are potentially at risk from acquiring a blood-borne virus following an inoculation injury. It is therefore essential that any occupational exposure to blood or body fluid is treated immediately, irrespective of whether there is any known risk of infection.

The DH (2008) advises encouraging the wound to bleed as the initial action following a

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sharps injury. Sucking of the wound by mouth is not recommended. If exposure has occurred to the eyes or mouth these areas should be irrigated with water. If contact lenses are being worn then eyes should be irrigated both before and after their removal. Healthcare professionals should follow local occupational health department policy and protocol regarding reporting of such incidents and receiving further expert advice.

## Conclusion

All healthcare professionals are at risk from NSIs and sharps injuries. Continuing

implementation of safe working practices is paramount, as are risk assessment, risk elimination, training in the use of devices and awareness of the consequences of NSIs and sharps injuries. Healthcare professionals have a pivotal role in assessing risks and evaluating any new safety devices introduced in their clinical area.

It is important that all healthcare providers in the UK develop robust, appropriate and effective strategies to reduce NSIs and sharps injuries by implementing the EU Directive **NS**  
**Complete time out activity 6**



**6** Now that you have completed the article, you might like to write a practice profile. Guidelines to help you are on page 60.

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