Needlestick and sharps injuries in diabetes: R U FIT4Safety?

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In 2010, the European Union adopted the "Council Directive 2010/32/EU Implementing the Framework Agreement on Prevention from Sharps Injuries in the Hospital and Healthcare Sector". Member states of the EU have until 11 May 2013 to implement the directive into national legislation. This article examines the issues concerning needlestick injuries and the recent publication of "Safety of sharps in diabetes recommendations".

Needlestick injuries (NSIs) are common among healthcare workers (HCWs) within both the hospital and community environment. In a survey of over 600 nurses, it was identified that 32% had received an NSI whilst giving an injection to a patient with diabetes (Costigliola et al, 2012). Needlestick injuries may occur for a number of reasons including a lack of training on the safe use and disposal of needles and sharps, and a lack of knowledge of the consequences of such injuries, as well as the types of devices used and procedures undertaken.

NSIs can transmit disease and therefore are a significant occupational hazard for HCWs. Between 1997 and 2009, there were 17 recorded cases of HCWs sero-converting to hepatitis C in England following percutaneous exposure to a virus-infected patient (NHS Employers, 2011). Five cases of HIV sero-conversions resulting from percutaneous exposure were reported in HCWs in the UK up until 2007; however, there have been no new cases reported since 1999 (Health Protection Agency, 2008). In France, three occupationally acquired hepatitis C infections were transmitted from subcutaneous NSIs (Lot et al, 2001).

In October 2011, 57 leaders in the field of injection technique and sharp safety from 14 different countries gathered in Brussels to attend the Workshop on Injection Safety in Endocrinology (WISE). The delegates from the UK later formed "FIT4Safety in UK and Ireland" and, in May, published the "Safety of sharps in diabetes recommendations" (Forum for Injection Technique, 2012). These recommendations provide contemporaneous evidence-based best practice information to assist individuals and organisations in identifying the risks associated with sharps and accidental blood or body fluid exposure.

Safety of sharps in diabetes recommendations 2012

The recommendations are divided into seven categories: risk; European legislation; device implications; injection technique implications; education and training; value; and awareness and responsibility. The discussion below provides more insight into these recommendations.

Article points

1. Needlestick injuries are common among healthcare workers within both the hospital and community environment.
2. The authors examine the recent recommendations regarding the safety of sharps in diabetes and the issues concerning needlestick injuries.
3. It is concluded that the continued implementation of safe working practices is vital, for which healthcare workers have a pivotal role.

Key words

- FIT4Safety
- Needlestick injuries
- Sharps

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Box 1. Hierarchy of controls for reducing the risk of exposure to blood-borne pathogens.

Elimination of hazard (most effective)
- Substitute injections by administering medications through another route.
- Remove sharps and needlesticks, and eliminate all unnecessary injections.

Engineering controls
- Employ safety devices.

Administrative controls
- Develop policies aimed to limit exposure to the hazard.
- Incorporate a needlestick prevention committee.
- Implement an exposure control plan.
- Remove all unsafe devices.
- Ensure consistent training on the use of safe devices.

Work practice controls
- Safe handling and disposal of sharps.

Personal protective equipment (least effective)
- Place barriers and filters between the healthcare professional and the hazard, for example: eye goggles; face shields; gloves; masks; and gowns.

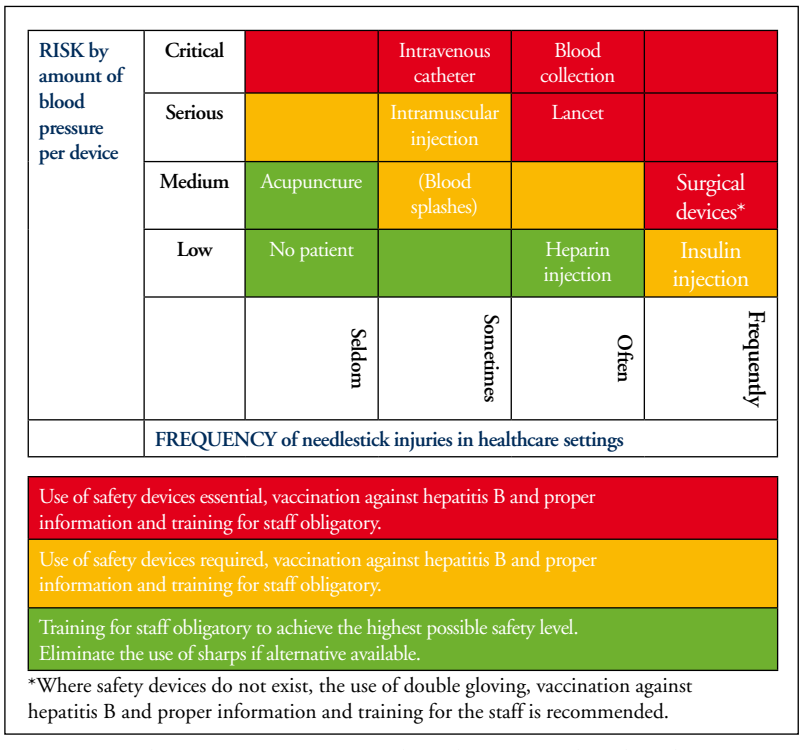


Figure 1. Risk assessment matrix and analysis (reproduced with permission from Wittmann, 2011).

Risk

Risk of transmission following an NSI

Cardo et al (1997) identified that the risk of transmission following NSIs or sharps injuries may be affected by:
- The depth of injury sustained.
- The type of needle or sharp used.
- The amount of blood or bodily fluid inoculated at the time of injury.
- Whether the device was previously in the patient's vein or artery.
- How infectious the patient is at the time of the injury.

In cases where an injury results from a hollow-bore needle that has been used to access directly into a vein or artery, the risk of transmission is higher because it contains more blood and therefore carries a greater risk than that of a solid needle or blade.

Which healthcare workers are at risk?

The HCWs at increased risk of acquiring sharps injuries or NSIs include doctors, nurses, phlebotomists, and domestic service staff, such as cleaners, porters and waste removal teams. Data from the UK and US indicate that nurses account for 45–63% of reported NSIs and sharps injuries among HCWs, and that medical staff account for 9–17% of all such injuries (Mercier, 1994; Cone, 2000; NHS Scotland, 2001). In the UK, almost 40% of NSIs and sharps injuries were experienced by someone other than the original user of the device, known as downstream workers (May and Churchill, 2001).

Risk assessment

Foley and Leyden (2002) identified a hierarchy of controls to reduce the risk of exposure to blood-borne pathogens (see *Box 1*).

The priority is to eliminate and reduce the use of needles and other sharps where possible. Furthermore, Wittmann (2011) developed a standardised risk-assessment matrix for medical sharps which identifies the potential risks associated with devices or procedures, and the appropriate level of sharps safety required (see *Figure 1*).

European legislation

Many sharps injuries or NSIs are preventable and employers have a duty to ensure the safety of their employees. The key legislation in the UK, addressing the issues of protecting HCWs from obtaining a sharps injury or NSI, is identified in *Box 2*. Further to this legislation, member states of the European Union have until 11 May 2013 to implement the Council Directive 2010/32/EU framework agreement on the prevention from sharps injuries in the hospital and healthcare sector. The main aims of the directive include:

- To achieve the safest possible working environment for employees and patients.
- To prevent injuries to HCWs as a result of sharps or needlesticks.
- To set up an integrated approach, establishing policies in risk assessment, risk prevention, training, information, awareness raising and monitoring, including the provision of medical devices incorporating safety-engineered protection mechanisms.

The key requirements that need to be implemented include:

- Risk assessment – quantifying the risk of exposure to a blood-borne pathogen from NSIs and sharps.
- Risk elimination and prevention, and review practice. Where possible, eliminate the unnecessary use of sharps, use safety devices, improve education and awareness, review staffing levels, and ensure personal protective equipment and appropriate sharps disposal systems (SDSs) are available at the point of use. Ensure the organisation has developed an overall occupational exposure policy.
- Training on the use, safe handling and disposal of sharps procedures.
- Promoting occupational exposure awareness, such as that of the risks associated with exposure to blood and body fluid, hepatitis B virus immunisation and occupational exposure reporting.
- Information regarding sharps injuries or NSIs should be reported promptly and appropriately, and the risks identified following a root-cause analysis into each case.
- Awareness raising and monitoring. Employers are responsible for ensuring all staff are aware of the risks associated with occupational exposure from sharps/NSI. In addition, health monitoring and vaccination should be provided where available.

The directive requires that healthcare providers undertake all that is reasonably practical to prevent HCWs and other staff from harm. Failure to implement the directive will be seen as a criminal offence. Strauss (2012) identified the elements in the EU directive, which together create a "wall of safety" (see *Figure 2*).

Box 2. UK legislation protecting healthcare workers from needlestick or sharp injury.

- The Occupiers Liability Act, 1957.
- The Health and Safety at Work Act, 1974.
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations, 1995 (RIDDOR).
- Council Directive, 89/391/EEC.
- European Directive, 89/655/EEC.
- The Management of Health and Safety at Work Regulations, 1999.
- EC Directive, 2000/54/EC.
- Control of Substances Hazardous to Health Regulations, 2002.
- Health and Social Care Act, 2008
- Code of Practice on the prevention and control of infections and related guidance, 2010.

Device implications types of devices

Passive versus active

There are two main types of features used in the design of safety-engineered needle devices (SENDs). These include the passive SEND, in which no additional actions are required by the user to activate the safety feature, and the active SEND, in which the user is required to activate the safety feature (Centers for Disease Control and Prevention, 2008). Strauss and WISE Consensus Group (2012) identified the main features of a SEND (see *Box 3*).

Evaluating safety-engineered needle devices

When evaluating a SEND, four key factors should be examined, including safety, usability, compatibility with need and ensuring the device does not cause other concerns, such as splashing

"It has been reported that, following the introduction of three safety-engineered needle devices, a significant reduction in the number of reported needlestick injuries was achieved."

Figure 2. Elements in the EU directive which together create a "wall of safety" (reproduced with permission from Andreas Wittmann; also published in Strauss, 2012).

Box 3. 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).

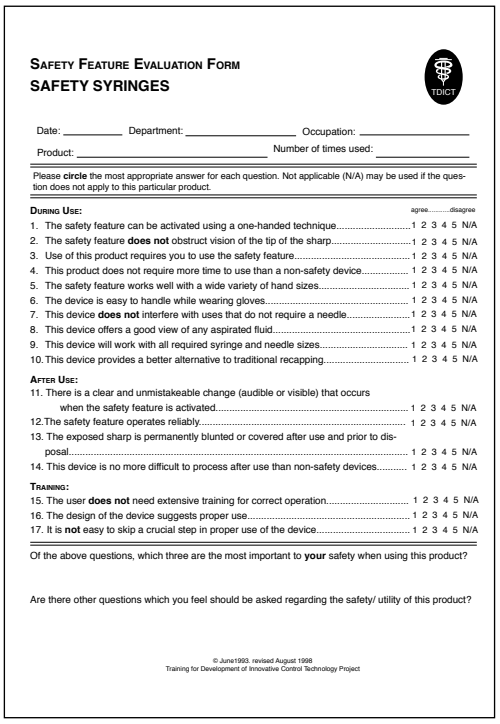
on activation (Adams and Elliott 2003; 2006a; Roff, 2011). To assess product safety, a systematic evaluation should be undertaken by the users of the device in the clinical setting (Adams and Elliott, 2003). Examples of safety device evaluation tools have been devised by the Training for Development of Innovative Control Technologies (2012; see *Figure 3*).

Adams and Elliott (2006a) reported that, following the introduction of three SENDs, including safety insulin syringes, safety needles and safety blunt needles, a significant reduction in the number of reported NSIs (70%) was achieved.

Injection pens are auto-delivery devices designed for the self-administration of medicine via the subcutaneous route. Pellissier et al (2006) identified in a study undertaken in France that the NSI rate associated with injection pens (IPs), of which 60% was related to disassembly and re-capping, was six times that of the NSI rate associated with disposable syringes. It is recognised

Page points

1. A variety of safety-engineered needle devices (SENDs) have become available, designed to minimise the risk of needlestick injuries (NSIs).
2. It has been demonstrated that the increased cost of SENDs is offset by the reduction of costs associated with the investigation and treatment of potential NSIs.
3. Correct injection technique and needle length is important to ensure optimum benefit from insulin injections.



SAFETY FEATURE EVALUATION FORM
SAFETY SYRINGES

TDICT

Date: _____ Department: _____ Occupation: _____

Product: _____ Number of times used: _____

Please **circle** the most appropriate answer for each question. Not applicable (N/A) may be used if the question does not apply to this particular product.

	agree.....disagree
DURING USE:	
1. The safety feature can be activated using a one-handed technique	1 2 3 4 5 N/A
2. The safety feature **does not** obstruct vision of the tip of the sharp	1 2 3 4 5 N/A
3. Use of this product requires you to use the safety feature	1 2 3 4 5 N/A
4. This product does not require more time to use than a non-safety device	1 2 3 4 5 N/A
5. The safety feature works well with a wide variety of hand sizes	1 2 3 4 5 N/A
6. The device is easy to handle while wearing gloves	1 2 3 4 5 N/A
7. This device **does not** interfere with uses that do not require a needle	1 2 3 4 5 N/A
8. This device offers a good view of any aspirated fluid	1 2 3 4 5 N/A
9. This device will work with all required syringe and needle sizes	1 2 3 4 5 N/A
10. This device provides a better alternative to traditional recapping	1 2 3 4 5 N/A
AFTER USE:	
11. There is a clear and unmistakeable change (audible or visible) that occurs when the safety feature is activated	1 2 3 4 5 N/A
12. The safety feature operates reliably	1 2 3 4 5 N/A
13. The exposed sharp is permanently blunted or covered after use and prior to disposal	1 2 3 4 5 N/A
14. This device is no more difficult to process after use than non-safety devices	1 2 3 4 5 N/A
TRAINING:	
15. The user **does not** need extensive training for correct operation	1 2 3 4 5 N/A
16. The design of the device suggests proper use	1 2 3 4 5 N/A
17. It is **not** easy to skip a crucial step in proper use of the device	1 2 3 4 5 N/A

Of the above questions, which three are the most important to **your** safety when using this product?

Are there other questions which you feel should be asked regarding the safety/ utility of this product?

Figure 3. Example of a safety feature evaluation form (Training for Development of Innovative Control Technologies, 2012).

that IPs have been shown to improve the patient experience and should be offered to patients routinely (Da Costa et al, 2002). Furthermore, nurses agreed that IPs were more convenient, simple and easy to use, and noted an overall improvement compared with conventional vials and syringes (Davis et al, 2009). Therefore, there is a need to improve the HCW safety associated with these devices. There are a variety of IP-SENDs available, which have been designed to minimise the risk of NSIs (see *Box 4*).

Costs and benefits

Financial considerations are of paramount importance when initiating any change of clinical practice. Glenngård and Persson (2009) completed a study to evaluate the costs associated with the implementation of SENDs to reduce the risk of NSIs in 18 hospitals in Sweden. The study demonstrated that the increased cost of SENDs was offset by the reduction of costs associated with the investigation and treatment of potential NSIs.

Injection technique implications

Correct injection technique is important to ensure the optimum benefit is gained from the injected drug, such as insulin. Needle length is also important to ensure the insulin is delivered into the subcutaneous layer. Unfortunately, there are only 8 mm and 12.7 mm needles available on disposable insulin syringes; 12.7 mm needles should not be used as there is a real danger of administering the insulin intramuscularly, which can cause major hypoglycaemia (Karges et al, 2005), and 8 mm needles may not be suitable for all patients, especially thin adults or children. Where only an 8 mm needle is available, then a lifted skin-fold will be

Box 4. Examples of safety-engineered needle devices.

AutoShield™ Duo Safety Pen Needle

Monoject™ Insulin Safety Syringe

Terumo SurGuard™

Clickfine® AutoProtect™ Safety Pen Needle

necessary to ensure that the insulin is still delivered into the subcutaneous layer. This could cause a potential problem as the hand holding the lifted skin-fold is at risk from an NSI. Thus, IP-SENDs and insulin syringes should always be used when insulin is being administered by an HCW.

Education and training

Safe handling and disposal of sharps

All HCWs should be trained and assessed in the correct use and disposal of sharps and SENDs. The principles concerning the safe use and disposal of sharps and IPs have been identified by the Royal College of Nursing (2012), Centers for Disease Control and Prevention (2012) and NICE (2012); see *Box 5* for an overview of these principles.

Vaccination

Pre-exposure vaccinations to hepatitis B should be considered for all HCWs who are at risk of exposure to the virus from contact with blood, blood-stained body fluid or tissue (Department of Health, 2006).

First-aid action

The Department of Health (2008) advises that the initial action in the event of either an NSI or sharps injury should be to encourage the wound to bleed. Sucking of the wound by mouth is not recommended. Healthcare workers should then immediately follow local policy and protocol regarding receiving further expert advice in order to reduce their risks associated with potential viral transmission following the sharps injury or NSI.

Value and costs related to needlestick and sharps injuries

Treatment costs and loss of productivity as a result of NSIs and sharps injuries may place additional financial strain on the NHS. Financial costs associated with the initial treatment of a staff nurse following exposure to a patient with hepatitis B, hepatitis C or HIV have been calculated (Adams and Elliott, 2006b).

The costs were estimated to be £1540, £235 and £938 for exposure to patients with hepatitis B, hepatitis C and HIV respectively.

"All healthcare workers should be trained and assessed in the correct use and disposal of sharps and safety-engineered needle devices."

In addition to the financial costs, there are the psychological traumas that the injured HCW may experience whilst waiting for the results of blood tests confirming whether there has been transmission of a life-threatening infection following a sharps injury or NSI. Costigliola et al (2012) identified the following emotional responses: depression; crying spells; tension in the family; relationship issues; panic attacks; excessive worry; and the inability to work.

Box 5. Principles of safe handling and disposal of sharps and injection pens.

- Handling of sharps should be 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 are not passed directly hand to hand.
- 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 re-capped.
- 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 patients' homes.
- All sharps containers should conform to UN standard 3291 and British Standard 7320.
- Sharps containers are not filled to more than two-thirds.
- Sharps containers are signed on assembly and disposal.
- Sharps containers should be temporarily closed when not in use.
- Sharps containers are stored safely away from the public and out of reach of children.
- Sharps containers should be disposed of every 3 months even if not full.
- 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.
- Insulin pens containing multiple doses of insulin are meant for use on a single person only, and should never be used for more than one person, even when the needle is changed.
- Insulin pens should be clearly labelled with the patient's name or other identifying information to ensure that the correct pen is used only on the correct individual.
- Hospitals and other facilities should review their policies and educate their staff regarding the safe use of insulin pens and similar devices.
- If re-use is identified, exposed patients should be promptly notified and offered appropriate follow-up including blood-borne pathogen testing.

Awareness and responsibility

Waste disposal varies amongst councils throughout the UK. The "gold standard" option is a system providing the sharps user with an SDS to dispose of sharps after every use. When the SDS is two-thirds full, it would be collected free of charge by the waste department of the local council and replaced with an empty SDS for future use.

If people with diabetes do not have access to an SDS, then this may result in the syringe or IP being discharged into the household refuse, leading to an increase the risk of NSIs by downstream workers, exemplified by an incident in West Sussex where two waste disposal men accidently incurred NSIs from waste (BBC News, 2012).

Conclusion

All HCWs are at risk from NSIs and sharps injuries. Continuing implementation of safe working practices is vital, as is risk assessment, risk elimination, training in the use of devices and awareness of the consequences such injuries. HCWs have a pivotal role in assessing risks and evaluating any new SEND introduced in their clinical areas.

It is anticipated that the "Safety of sharps in diabetes recommendations" (Forum for Injection Technique, 2012) will support individuals and organisations to apply the new EU directive to clinical practice in their field of care. ■

Adams D, Elliott TS (2003) A comparative user evaluation of three needle-protective devices. *Br J Nurs* **12**: 470–4

Adams D, Elliott TS (2006a) Impact of safety needle devices on occupationally acquired needlestick injuries: a four-year prospective study. *J Hosp Infect* **64**: 50–5

Adams D, Elliott TS (2006b) Financial costs associated with a contaminated needlestick injury. *J Hosp Infect* **64**: S31

"All healthcare workers are at risk from needlestick injuries and sharps injuries. Continuing implementation of safe working practices is vital, as is risk assessment, risk elimination, training in the use of devices and awareness of the consequences such injuries."

BBC News (2012) *Needles in rubbish pose infection risk for Arun binmen*. BBC, London. Available at: http://bbc.in/NJqijF (accessed 06.11.12)

Cardo DM, Culver DH, Ciesielski CA et al (1997) A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. *N Engl J Med* **337**: 1485–90

Centers for Disease Control and Prevention (2008) *Workbook for designing, implementing, and evaluating a sharps injury prevention program*. CDC, Atlanta, GA, USA. Available at: http://1.usa.gov/Xj83bi (accessed 06.11.12)

Centers for Disease Control and Prevention (2012) *CDC clinical reminder: Insulin pens must never be used for more than one person*. CDC, Atlanta, GA, USA. Available at: http://1.usa.gov/wDFctw (accessed 06.11.12)

Cone J (2000) *Needlestick injury surveillance in California, 1998-1999*. California Department of Health Services, Sacramento, CA, USA. Available at: http://bit.ly/TvJMKh (accessed 06.11.12)

Costigliola V, Frid A, Letondeur C, Strauss K (2012) Needlestick injuries in European nurses in diabetes. *Diabetes Metab* **38**(Suppl I): S10–4

Da Costa S, Brackenridge B, Hicks D (2002) A comparison of insulin pen use in the United States and the United Kingdom. *Diabetes Educ* **28**: 52–60

Davis EM, Bebee A, Crawford L, Destache C (2009) Nurse satisfaction using insulin pens in hospitalized patients. *Diabetes Educ* **35**: 799–809

Department of Health (2006) *Immunisation against infectious disease*. The Stationery Office Limited, London. Available at: http://bit.ly/St2ocw (accessed 06.11.12)

Department of Health (2008) *HIV post-exposure prophylaxis: guidance from the UK Chief Medical Officers' Expert Advisory Group on AIDS*. DH, London. Available at: http://bit.ly/wEGXu (accessed 06.11.12)

Foley M, Leyden AT (2002) *American Nurses Association – Independent Study Module Needlestick Safety and Prevention*. World Health Organization, Switzerland. Available at: http://bit.ly/YJh8cJ (accessed 06.11.12)

Forum for Injection Technique (2012) *FIT4Safety injection safety in UK and Ireland: Safety of sharps in diabetes recommendations 1st Edition*. FIT, London. Available at: http://bit.ly/YJ5Jtf (accessed 06.11.12)

Glenngård AH, Persson U (2009) Costs associated with sharps injuries in the Swedish health care setting and potential cost savings from needle-stick prevention devices with needle and syringe. *Scand J Infect Dis* **41**: 296–302

Health Protection Agency (2008) *Eye of the Needle: United Kingdom surveillance of significant occupational exposure to bloodborne viruses in healthcare workers*. HPA, London. Available at: http://bit.ly/TueSQ0 (accessed 06.11.12)

Karges B, Boehm BO, Karges W (2005) Early hypoglycaemia after accidental intramuscular injection of insulin glargine. *Diabet Med* **22**: 1444–5

Lot F, De Benoist AC, Tarantola A et al (2001) Infections professionnelles par le VIH et le VHC en France chez les personnel de santé. *Bulletin Epidémiologique Hebdomadaire* **2**: 167–70

May D, Churchill P (2001) Sharps injury surveillance: a pilot study. *AIDS and Hepatitis Digest* **83**: 4–8

Mercier C (1994) Reducing the incidence of sharps injuries. *Br J Nurs* **3**: 897–8

NHS Employers (2011) Needlestick injury. Available at: http://bit.ly/VT1WFN (accessed 06.11.12)

NHS Scotland (2001) *Needlestick injuries: Sharpen your awareness*. Scottish Executive, Edinburgh. Available at: http://bit.ly/PDIbDY (accessed 06.11.12)

NICE (2012) *Infection: Prevention and control of healthcare-associated infections in primary and community care*. NICE, London. Available at: http://bit.ly/H3tLcn (accessed 06.11.12)

Pellissier G, Miguéres B, Tarantola A et al (2006) Risk of needlestick injuries by injection pens. *J Hosp Infect* **63**: 60–4

Roff M (2011) *Splatter hazard from syringe needle protectors an unintended consequence*. British Occupational Hazard Society, Derby. Available at: http://bit.ly/QobMCx (accessed 06.11.12)

Royal College of Nursing (2012) *Wipe It Out: One chance to get it right*. RCN, London. Available at: http://bit.ly/y6eZ1i (accessed: 06.11.12)

Strauss K (2012) Synopsis of the WISE meeting. *Diabetes Metab* **38**(Suppl I): S15–26

Strauss K, WISE Consensus Group (2012) WISE recommendations to ensure the safety of injections in diabetes. *Diabetes Metab* **38**(Suppl I): S2–8

Training for Development of Innovative Control Technologies (2012) *Safety feature evaluation forms*. TDICT, San Francisco, USA. Available at: http://bit.ly/Tul1M4 (accessed 06.11.12)

Wittmann A (2011) *Toolkit for implementation of the European directive on prevention of sharps injuries (Council Directive 2010/32/EC) in member states*. European Biosafety Network. Available at: http://bit.ly/VT8sfA (accessed 06.11.12)