A STRATEGY TO REDUCE SHARPS INJURIES

Engineered sharps containers

Every year over 40 000 health-care workers in South Africa suffer accidental injury from needles and other medical sharps, and as a significant proportion of these are associated with sharps containers, design considerations are crucial.

Safer container engineering can reduce SI risk for health-care workers

Accidents caused by sharps containers carry a real risk of transmitting blood-borne pathogens from the patient to the health-care worker. Injured workers, their families and even the patient may suffer great stress following such injuries. Terry Grimmond outlines the impact of human factors engineering on sharps container design and how this can help to reduce the problem.

In South Africa, an alarming 20% of health-care workers suffer one or more sharps injuries (SIs) each year. Based on these studies, over 40 000 health-care workers in SA hospitals and community services suffer SIs annually. The rate is higher among specific staff groups – with up to 34% of nurses and up to 91% of junior doctors suffering SIs annually. This high incidence is some seven times higher than that recently reported in the USA. Moreover, the risk of SIs transferring blood-borne pathogens (BBPs) to local health-care workers is one of the highest in the world. Safe, economical initiatives are urgently needed as behavioural education alone is not enough. Engineered controls have proven significantly effective. This article examines SI prevention, the history of sharps containers and how safer container engineering can economically reduce SI risk for South African health-care workers.

Hierarchy of SI controls

Research in SI reduction confirms that SI reporting, BBP education and the hierarchy of SI controls effectively reduces SIs. I believe reporting comes first (identify the problem), then education (discuss the problem), then the hierarchy of controls (resolve the problem). The hierarchy is shown in figure 1, in descending order of efficacy.

I cannot stress enough the importance of reporting SI at individual, clinical unit, institutional and preferably national levels. Without reporting there is no evidence, and without evidence there is no support and no allocation of scarce South African resources.

Why are SA health-care workers more at risk?

South Africa is unique internationally in that several circumstances interact to place South African health-care workers at greater risk of acquiring a BBP:

- There are approximately 60 BBPs that can be transferred via blood or body fluid exposure (HIV, HBV and HCV are those most commonly documented) and many of these (e.g. Ebola, Marburg and malaria) are endemic in South Africa.
- South Africa is an 'injection' culture, i.e. there is a general belief among patients that their illness is more likely to be cured if medication is delivered by injection.
- As stated above, the SI rate among South African health-care workers is among the highest in the world.

Figure 1: Hierarchy of SI controls

Eliminate the sharp
(e.g. needleless IV; blunt suture needles)
↓
Isolate the sharp
(e.g. engineered devices; sharps containers)
↓
Work practice and administrative controls
(e.g. no recapping; adequate resources)
↓
Personal protective equipment
(e.g. gloves)

- South Africa has one of the highest rates of HIV endemicity in the world. In 2009 the UN estimated that:
- 29.4% of women attending antenatal classes and 17% of all 15 to 39 year olds in South Africa were HIV-positive.
- 5.6 million South Africans were living with HIV.
- Almost half of SIs go unreported and there is no national SI database – so there is little 'formal evidence' for safety lobbyists to use.
- Until 2008, South Africa had no standard by which sharps containers could be fit-for-use tested to ensure safe sharps disposal.
- Approximately 30% of South African health-care workers' positions are vacant, so the remaining workers are working harder and under more stress, which in turn increases the risk of their suffering an SI.
- The South African health system competes strongly for scarce financial resources and few hospitals can afford to adopt needle safety devices universally.

The interaction of the above means overworked South African health-care workers, compared to health-care workers in developed countries, are exposed to a greater number of potential BBPs while attending to a population with very high HIV endemicity, are using more sharps and are without the protection of safety devices for all risk procedures. The answer is to adopt economical engineered controls.

Engineered controls

Engineered controls, also known as safety devices and needle protection devices (NPDs), isolate or remove the blood-borne pathogens hazard from the workplace and include sharps containers, needleless systems and any sharp with engineered sharps injury protection (ESIP), i.e. a mechanism to disarm the sharp at the end of or immediately after the procedure.

Engineered controls are now universally used in developed countries and are required by a BBP-specific law in the US, general occupational health protection laws in Italy, France, Australia and New Zealand and provincial laws in Canada, and by 2013 these will be mandatory in all 27 European Union member states.

There is no doubt that safety device legislation is effective: the SI rate fell 34% within a year of the US BBP law enactment and legislation in some form has been the mainstay of SI reduction in all developed countries. However, NPDs are more expensive than standard devices and South Africa, like all developing countries, struggles to find the finances to afford them universally.

Needle safety devices for many procedures, such as IV therapy, intramuscular injection and phlebotomy, have been successfully trialled in South Africa and found by staff to be safe and easy to use, so it is simply a question of finances. With the increased use of safety devices internationally, their price is reducing and it is hoped they will soon come within reach of South African budgets.

CAUSES OF CASIs

- Depositing into SC:
  - SI from own sharp (aperture too small)
  - SI from sharp in SC (overfilling; insensitive door)
  - sharps bounced out (aperture too small).
- Sharp protruded from SC (insensitive door).
- Sharp penetrated SC (walls not strong enough).
- Placing hand in SC (no restrictive door).
- Manipulating SC (no restrictive door; closure not secure).

Until such time, more economical safety devices must be adopted. Safety engineered sharps containers are one such example.

Container-associated SIs

First recommended in 1975, commercial sharps containers became widely used in the US in the 1980s and were adopted to enable needles to be discarded without recapping and to allow disposal into safer containers than rubbish bags. However, a new subset of SI was initiated: container-associated SI (CASI). In the early years of commercial sharps container use, when most containers had a small aperture and required point-first deposition, the causes of CASI were reported as overfilling, penetration, depositing sharps and emptying. However, with the addition of counterbalanced and levered doors, new CASI categories emerged,

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including sharps retained in opening, protrusion, collisions with the hand and falling/bouncing out of the sharps container (table 1). Of the causes of CASI listed in table 1, US databases indicate that 88% are likely to be owing to small apertures and insensitive trays.

In countries using ESIP devices (which disarm the sharp prior to disposal), CASIs have decreased but this scenario does not apply to South Africa, where with the country's low use of ESIP devices, CASIs are likely to account for 10 to 20% of total SIs, i.e. 6 000 annually.

Sharps container design

Until recently, sharps containers had changed little in 20 years. Osterman first recommended stronger walls and wider apertures in 1975. Subsequent studies recommended increased puncture resistance, visualisation of fullness, hand restriction, secure closure, bracketry, clear labelling, counterbalanced doors, stability and one-handed deposit. However, very few sharps containers meet all these requirements and in 2003, after finding that CASIs accounted for 10.9% of SIs in California hospitals, Gillen and colleagues called for a redesign of containers.

Human factors engineering

HFE is the study of device-user interfaces to control use-related hazards. US Food and Drug Administration (FDA) promotes the term 'use-related' rather than 'user-related' error and most use-errors with medical devices are a result of device design, rather than user fault or device failure. Simply put, HFE accommodates a wider spectrum of human behaviour – it allows medical devices to be (almost) user-proof.

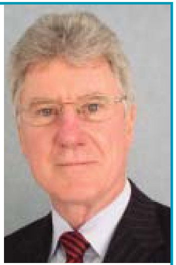
Recently HFE has been effectively applied to sharps containers, with the result that CASI can be significantly decreased. In a large multi-centre international study and a large multi-centre US study, a total of 22 hospitals converted to one particular HFE-designed container and in both studies CASI fell significantly – by over 80% – to the lowest rate published in international literature. The container in both studies (Sharpsmart, Daniels Sharpsmart Inc, Chicago IL) has 26 parts and is the product of five years of HFE research and interaction with clinical users. In focus group sessions and trials, nurses and doctors made it clear that they needed a large opening, passive overfill protection, hand-entry prevention, a horizontal deposit, a sensitive counterbalanced tray, stronger walls and a safe, tamper-proof locking mechanism. The Sharpsmart container met all these requirements. In taking the safety onus away from the user and being independent of any need for staff to monitor fullness constantly (it shuts itself off when full), the system passively protects users 24/7. The studies confirm the French finding that passive safety devices (those requiring less action by the user) are associated with less SIs. Extrapolating from the two studies above, in excess of 4 000 SIs could be prevented in South Africa if HFE features were possible in all sharps containers.

Recently, the South African distributor of the Sharpsmart system (Compass Waste Services, Durban) conducted the largest international user-satisfaction trial of the system at four major KwaZulu-Natal hospitals. Clinical staff found the system to be significantly safer and more user friendly than traditional sharps containers, without the significant cost increases of other safety devices.

Needle safety devices were developed so that sharps safety could be less dependent on human behaviour. This principle applies to sharps containers: enhanced container engineering increases user safety by reducing dependence on human behaviour.

The South African Department of Health is determined to protect its health-care workers. Until financial resources improve, HFE-designed sharps containers present an economical, proven means of reducing SI risk to local health-care workers – 6 000 CASIs is simply not acceptable. **3S**

ABOUT THE AUTHOR



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