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Use and activation of safety engineered sharps devices in a sample of 5 Florida healthcare facilities

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ABSTRACT

Introduction. The incidence of sharps injuries (SI) in U.S. fell significantly with mandatory use of safety engineered devices (SED) in 2001 but has remained static since. More than half of SI from SED are due to non-activation of devices and monitoring of activation is recommended. This paper outlines the findings of a sharps container (SC) contents audit conducted in Florida in September 2013.

Methods. Reusable, 22 liter sharps containers (Sharpsmart, Daniels Sharpsmart Inc, Chicago IL) were randomly selected from 5 healthcare facilities (HCF) in central Florida. Wearing protective apparel the operator opened, decanted and enumerated all hollow bore needles and sorted them into: conventional vs SED; capped vs uncapped; and activated vs non- activated SED.

Results. 261L of sharps (40.3kg) from 18 sharps containers from 4 hospitals and one large family clinic were enumerated (Table 1). 21.6% (196/907) of SED were not activated and overall, 42.5% of all devices were discarded 'sharp'.

Number and percent of devices within device category

	Conventional					Safety Engineered Device				Grand total
	Needle	Capped needle	Syringe -Needle	Capped Syr-Ndle	Total	Fully activated	Not fully Activated	Tampered with	Total	
No.	299	307	350	124	1,080	711	196	0	907	1,987
% of Total	15.0%	15.5%	17.6%	6.2%	54.4%	35.8%	9.9%	0%	45.6 %	100%

Discussion. It is disturbing that 39.9% of conventional needles were capped prior to discard and 42.5% of all devices were discarded as a 'naked' sharp. In this small sampling it is of concern that 12 years after U.S. SED legislation, 64.3% of healthcare professionals (HCP) placed themselves at risk by recapping or discarding naked needles. Many non-activated phlebotomy devices were visibly blood-contaminated. The reasons for non-activation of SED (ease of use, device preference, perception of patient adverse event, training) need be addressed.

Conclusion. The high proportion of devices being capped or discarded with an unprotected sharp may be a possible reason for the continued high SI incidence in the United States. A new vigor encompassing competency training, safety ownership and adoption of passive SED wherever possible is needed to protect HCP.

Conflict of Interest and Funding Statement

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Introduction

The risk to healthcare personnel (HCP) of bloodborne pathogen (BBP) transmission from percutaneous sharps injuries (SI) significantly decreased with the 2001 enactment of the OSHA needlestick safety and Prevention Act (NSPA) mandating use of safety engineered sharps devices (SED).[1] However it is perplexing that no significant fall in SI incidence has occurred in the 10 years following the NSPA.[2]

With mandatory use of SED, a rising proportion of SI sustained from SED (over conventional devices) is expected,[3]and SI due to non- or incomplete activation of the SED has risen from 35% immediately after the NSPA,[4] to 56% more recently.[3] From an early time, the activation of SED was recognised as a key component in SED efficacy and monitoring of activation rates is recommended.[5] Monitoring of SED activation rates can only effectively be achieved by decanting SC contents and counting activated and non-activated devices under controlled conditions and environments.[6] No published post-NSPA reports of U.S. SC contents audits were found in the literature and this paper outlines the findings of a SC contents audit conducted in Florida in September 2013.

Methods

In September 2013 an area was set aside at a regulated medical waste factory and patient-room, 22 liter reusable sharps containers (Sharpsmart, Daniels Sharpsmart Inc, Chicago IL) were randomly selected from large transporters arriving from healthcare facilities (HCF). The names of facilities and order of arrival of transporters were unknown to the operator. Depending on the number of SC arriving from the HCF, between 3 and 7 SC were chosen from each facility. Sharps containers were confined to the 22 liter size commonly used for patient rooms to exclude laboratory and operating room sharps waste. Each SC was opened and the contents gently decanted onto a large plastic-lined bench. Wearing eye protection, long-sleeve gown, covered leather shoes and heavy-duty gloves, and using tongs, the contents of each SC was sorted item by item into the categories depicted in Table 1. Only hollow bore needle devices were enumerated. Safety engineered phlebotomy devices connected by tubing to a 'naked' conventional hollow-bore needle were classified as 'conventional' devices. All categories were weighed to nearest gram on electronic kitchen scales. Upon completion of the audit, all sharps waste was returned to the factory system for autoclaving and disposal.

Results

A total of 18 sharps containers were sampled from 4 hospitals and one large family clinic in the center of Florida. A total volume of 261 liters of sharps (40.3 kg) was audited and 1,987 hollow-bore devices categorized and enumerated. Data on device numbers and percentages within major categories are show in Table 2.Three facilities had a predominance of anti-emetic, saline or heparin conventional syringe-needle devices. No SED had evidence of tampering or removal of the safety mechanism.

Table 1. Categories into which sharp container contents were sorted

Conventional Hollow-bore devices	• Needles, wingsets, blood-draw barrels (needle protruding). • Capped needles • Syringe-needle combinations • Capped syringe-needle combinations
Safety engineered Hollow-bore devices	• Fully activated • Not activated or partially activated (i.e. sharp protruding, or capped) • Tampered with (safety mechanism removed)
Other sharps	e.g. scissors, forceps, vials with needles inserted, open ampoules, sutures, broken glass, vials with jagged metal tops, potential sharps (fragile glass items), blood-draw barrels (internal needle only), safety lancets
Non-sharps	e.g. paper, trays, plastic packaging, tissue, gloves, gauze, tubes, syringes, medications, intact vials (without jagged tops), bottles

Table 2. Number and percent of devices within device category

	Conventional					Safety Engineered Device				Grand total
	Needle	Capped needle	Syringe-Needle	Capped Syr-Ndle	Total	Fully activated	Not fully Activated	Tamper	Total	
No.	299	307	350	124	1,080	711	196	0	907	1,987
% of Total	15.0%	15.5%	17.6%	6.2%	54.4%	35.8%	9.9%	0%	45.6%	100%
Range of Total %	3.4% - 36.4%	1.6% - 42.2%	4.6% - 42.7%	2.0% - 9.2%	**30.5% - 85.2%**	10.0% - 60.4%	0.6% - 27.5%	0.0%	**14.8% - 69.5%**	
% of sub-category	27.7%	28.4%	32.4%	11.5%	100%	78.4%	21.6%	0%	100%	
Range of sub-category %	8.4% - 42.7%	3.2% - 49.5%	5.4% - 73.7%	2.3% - 25.2%		39.6% - 86.9%	1.4% - 60.4%	0.0%		

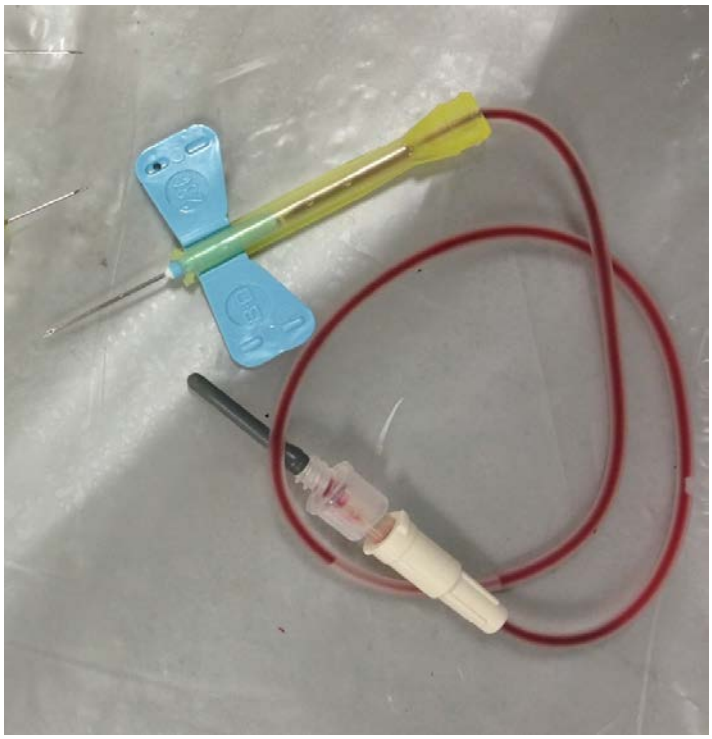

Fig 1. Unprotected needle at both ends of non-activated wingset SED

Fig 1. Non-activated or partially activated SED

Discussion

In this study, of all hollow-bore devices, 54.4% were conventional and 45.6% were SED and the range of these proportions among the 5 HCF was extensive (Table 2). The high level of conventional device use is surprising given the availability of SED for most sharps procedures and that conventional syringe proportion was shown to drop from 56% to 7% following SED legislation in Canada.[6,7] Not all sharp procedures have SED available, e.g. some biopsy procedures, and it was noted that of the 1,080 conventional devices, 15 were breast biopsy needles.

Of the conventional needles, 39.9% were capped. Combining conventional devices and SED, 42.5% were discarded as a 'naked' sharp. Included in the latter category, particularly from one HCF, were phlebotomy wingset SED that had 'naked' blood-barrel needles on the end of the tubing, i.e. the barrel presumably had been removed (Fig 1).

The sample of 18 SC from 5 HCF is small, however the fact that 64.3% of HCP (1,276 of 1,987 hollow-bore items) placed themselves at risk by recapping or discarding naked needles is disturbing. While it was not part of this study to record the presence of blood, many naked-needle phlebotomy devices were visibly blood-contaminated (Fig 1). In a Canadian study one year after passage of provincial legislation mandating the use of SED, 56% of conventional syringes were recapped,[7] – it is worrisome that 12 years after U.S. SED legislation, 40% of conventional needles in the 5 HCF were still being recapped.

Up to a third of total SI could be prevented if SED were activated after use.[3] Pre-NSPA, the non-activation rate of SED was found to be 30-40%,[8,9] and it was shown that with SED familiarity, high activation rates are possible.[10] It is of concern that more than a decade after the NSPA, 22% of the 907 SED in this study were discarded with the sharp naked (Fig 2). Based on BBP transmission risk, Stringer and Haines proposed that an "acceptable" phlebotomy and IV SED activation rate should be 100% or close to it, whereas syringe SED activation rates should be 90% or greater.[6] These activation levels were not achieved in this study.

More than 1 year after passage of legislation mandating the use of safety devices in British Columbia hospitals, Stringer and colleagues expressed their concern that the risk from exposed sharps remained too high because of the ongoing use of conventional devices and non-activation of SED. [7]This study, whilst a small sampling, presents a similar picture of low SED use and low SED activation rates.

A recent U.S. national survey estimated that 320,000 HCP sustain SI annually and that the incidence of SI had not decreased over the previous decade.[2] This audit may give some indication of the possible reasons for the continued high incidence – an unacceptable proportion of devices are being capped or discarded with an unprotected sharp. The results also confirm the continued need for ergonomically sited, safety engineered sharps containers.[11, 12]

We cannot rest in our quest for zero SI. The reasons for non- or partial activation of SED are reported to be ease of use, device preference, perception of patient adverse event, and training.[9] It was heartening to see papers presented at the 2013 AOHP National conference that addressed several or all of these reasons and, with new, less behavior-dependent SED and education, were able to markedly reduce their procedure-specific SI.[13,14]

The dependence on manual activation of SED plays a major part in SI and HCF need pursue a greater use of passive devices wherever possible.[15] We must find new vigor to protect our healthcare workers – it may encompass more regular, competency-based education, staff ownership of their safety, or technology less dependent on human behavior, but a change must occur.[2]

This study's limitations are: that the HCF come from one region within Florida and the results may not be applicable to other regions or other states. A small number of SC were sampled from each HCF and may not be representative of the HCF as a whole; loose caps were evident in the waste so it was not possible to determine if some uncapped needles had lost their caps in the decanting process; with some capped needles and capped syringe-needles, it was not possible to tell if they had been discarded unused; the same dilemma applied with some capped non-activated SED; and it was not possible to know whether HCF risk assessment, or clinical assessment, dictated that SED were not required in certain low BBP-risk procedures.

Conclusion.

The high proportion of devices being capped or discarded with an unprotected sharp may be a possible reason for the continued high SI incidence in the United States. A new vigor encompassing competency training, safety ownership and adoption of passive SED wherever possible is needed to protect HCP.

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