Irish Medical Journal
Established 1867

Issue: Ir Med J; Vol 112; No. 10; P1023

Have Legislative Interventions Impacted the Incidence of Needlestick Injuries?

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Abstract

Introduction
The aim of this study was to examine the impact the EU Directive for the Prevention of Sharps injuries had on the incidence of needlestick injuries (NSI) in Ireland.
Methods
A five-year retrospective study prior to, and after the introduction of these regulations, was conducted. Secondary data from the Occupational Health Department's annual NSI reports were used. The population studied were healthcare workers who reported a NSI from 2013 to 2017.
Results
The incidence of NSI varied from 157 in 2017 to 207 in 2014. 'Miscellaneous needles' was the category which caused the most NSI (23%). 'Disposable needles with syringes' accounted for 20% of all NSI before the legislation; this figure was reduced to 12-15% after the regulations were introduced.
Conclusion
The EU regulations did not reduce the incidence of NSI. A lower incidence of NSI was reported from 'disposable needles with syringes' after the implementation of the regulations.

Introduction

It is estimated that over one million needlestick injuries occur annually in the European Union[1]. A needlestick injury has been defined as 'an injury involving a contaminated sharp medical device, irrespective of whether or not the wound was bleeding'[2].

Needlestick injuries may result in the transmission of blood borne viruses such as hepatitis B, hepatitis C or human immunodeficiency virus[3]. As well as the risk of transmission of blood borne viruses, the associated psychological distress associated with needlestick injuries can be quite high [4]. Needlestick injuries have significant costs associated with them. A 2016 systematic review estimated that direct and indirect costs of each needlestick injury ranged from 650-750 international dollars. These costs include laboratory fees, prophylactic treatment and lost productivity. These figures are conservative as the review didn't include the cost of treating an occupational infection, litigation or compensation. As a result, the final cost may be much higher [5]. The National Health Service in the UK paid out over £4,000,000 to 1213 claimants from 2012-2017 [6]. The additional cost associated with the introduction of safer sharps may be offset by reducing the expense of managing NSI.

The European Union (Prevention of Sharps Injuries in the Healthcare Sector) Regulations were implemented in Ireland in 2014 [7]. The regulations require that 'where there is a risk of exposure to injury and/or infection from sharps; the sharps must incorporate safety-engineered protection mechanisms, referred to as safer sharps, where these devices are available and appropriate' [7].

To ascertain the impact of these regulations, a literature review was conducted using PubMed and Cochrane library search engines. The search terms 'needlestick injury' and 'safety device' were used to identify relevant studies.

In 2006, prior to the introduction of the EU regulations, Cullen et al estimated that over 50% of all needlestick injuries and specifically, 80% of venepuncture or subcutaneous injection injuries could be prevented using safety engineered devices [8].

Dulon et al [2] examined the causes of needlestick injuries in Germany after the implementation of the EU Directive. They found widespread use (75%) of safety engineered devices in workplaces after implementation of the directive. However, twenty percent (20%) of needlestick injuries occurred when a safety engineered device was used; most of these required activation by the user. These safety engineered devices were usually needles for intravenous procedures such as butterflies or subcutaneous injections. They concluded that training for all healthcare workers on the use of safety engineered devices was necessary and should be repeated at regular intervals in order to achieve maximum benefit from the safer sharp devices.

The importance of the combination of safety engineered devices in addition to training was mirrored in a study by Van der Molen et al [9], who conducted a three-arm randomised controlled trial. The groups were randomised to the use of safety engineered devices and training, training only, or a control group. The authors found a reduction in self-reported needlestick injuries of sixty four percent (64%) in the group who received both safety engineered devices and training, compared to the control group. The second group, who received training only, had a reduction of twenty one percent (21%) in needlestick injuries compared to the control group.

A Cochrane review was carried out in 2014 to examine the benefits and harms of safety engineered devices [10]. Seventeen studies were included in the review. The authors found that there was either no evidence or very low-quality evidence that needlestick injuries were reduced with the use of safety engineered devices. In fact, they found moderate quality evidence that the use of safety engineered devices increased the risk of blood contamination for the recipient. The authors however assessed most of the studies in the review as low quality due to flaws in their methodology; in particular bias and confounding.

In summary, despite a high predicted reduction in needlestick injuries with the introduction and use of safety engineered devices, the evidence to date on the benefit of safer sharps has been disappointing.

This study was undertaken to examine the impact of the introduction of safety engineered devices before and after the implementation of the EU Directive for the Prevention of Sharps injuries in four university teaching hospitals in the Republic of Ireland. Secondary aims included identifying the instrument, location, and the staff member who received the needle stick injury to determine at risk staff, areas and devices.

Methods

A five-year retrospective study was conducted. The study population included healthcare workers who sustained and reported a needlestick injury to the respective Occupational Health Departments from January 2013 to December 2017 inclusive.

Information was taken from the Occupational Health Department's annual needle stick injury reports. If a variable was unclear, or further details were needed, the completed Blood/Bodily Fluid Exposure form, Epinet (the Software used to record needle stick injuries), or the computerised medical record in the Occupational Health Department were checked for clarification.

The variables recorded included the year the needlestick injury occurred, the instrument which caused the sharps injury, whether the instrument which caused the injury was a 'safer sharp', the role of the healthcare worker and the area of the hospital that the needlestick injury occurred.

The inclusion criteria were healthcare workers who reported a needlestick injury to the Occupational Health Department from January 2013 to December 2017 inclusive.

The exclusion criteria included healthcare workers who sustained a blood/bodily fluid exposure from a bite, splash or scratch and secondly, healthcare workers who sustained a needlestick injury but did not work in one of the four pre-defined hospitals.

The data was recorded in Microsoft Excel. Descriptive graphs and charts were generated in Microsoft Excel.

Ethical approval was granted for this study following submission of an application to the Clinical Research Ethics Committee of the Cork Teaching Hospitals.

Results

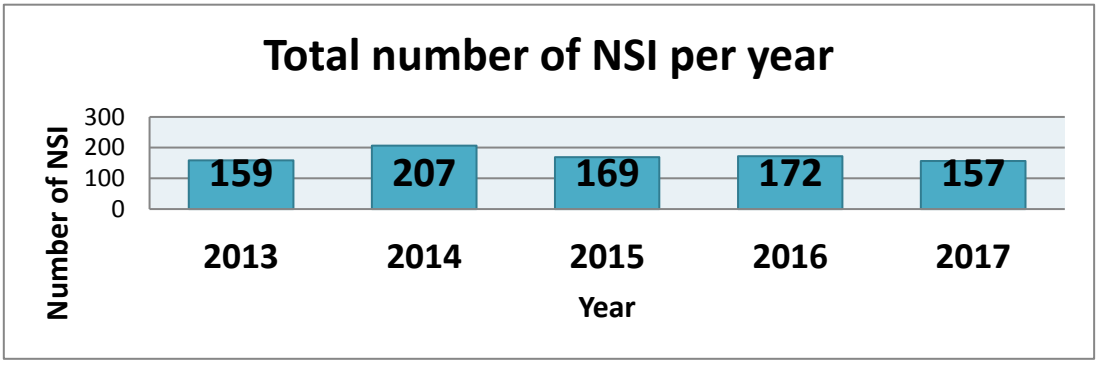
Table 1: Workplace-related variables of needlestick injuries by year

	2013	2014	2015	2016	2017	Total
Characteristics: N (%)						
Job category						
- Doctor	51 (32)	70 (34)	76 (45)	63 (37)	60 (38)	320 (37)
- Nurse	82 (52)	91 (44)	59 (29)	63 (37)	57 (36)	352 (41)
- Health & social care professionals	5 (3)	11 (5)	6 (4)	7 (4)	9 (6)	38 (4)
- Support staff	15 (9)	24 (12)	19 (11)	29 (17)	23 (15)	110 (13)
- Midwives	6 (4)	11 (5)	9 (5)	10 (6)	8 (5)	44 (5)
- Total	159	207	169	172	157	864
Hospital Area						
- Patient room/ward	71 (45)	90 (44)	70 (41)	60 (35)	66 (42)	357 (41)
- Emergency Department	19 (12)	25 (12)	16 (10)	20 (12)	19 (12)	99 (12)
- Intensive Care	3 (2)	4 (2)	2 (1)	8 (5)	2 (1)	19 (2)
- Theatre	30 (19)	43 (21)	39 (23)	33 (19)	28 (18)	173 (20)
- Treatment room	6 (4)	15 (7)	11 (7)	13 (8)	8 (5)	53 (6)
- Other	16 (10)	22 (10)	16 (10)	23 (13)	19 (12)	96 (11)
- Labour ward/theatre	10 (6)	6 (3)	12 (7)	10 (6)	8 (5)	46 (5)
- Neonatal Unit	3 (2)	0 (0)	0 (0)	0 (0)	2 (1)	5 (1)
- CUMH OPD/ED	1 (1)	2 (1)	2 (1)	1 (1)	2 (1)	8 (1)
- Missing	0 (0)	0 (0)	1 (1)	4 (2)	3 (2)	8 (1)
- Total	159	207	169	172	157	864
Device causing the NSI						
- Disposable syringe with needle	34 (21)	42 (20)	21 (12)	23 (13)	23 (15)	143 (17)
- Miscellaneous needle	36 (23)	57 (28)	32 (19)	37 (22)	36 (23)	198 (23)
- Stilette	10 (6)	8 (4)	17 (10)	10 (6)	9 (6)	54 (6)
- Vacuette needle	9 (6)	12 (6)	16 (10)	19 (11)	22 (14)	78 (9)
- Syringe with pre-filled cartridge	15 (9)	37 (18)	18 (11)	18 (11)	13 (8)	101 (12)
- Suture needle	16 (10)	21 (10)	21 (12)	32 (19)	17 (11)	107 (12)
- Scalpel	4 (3)	10 (5)	7 (4)	6 (4)	2 (1)	29 (3)
- Butterfly needle	5 (3)	6 (3)	7 (4)	7 (4)	15 (10)	40 (5)
- Other	27 (17)	10 (5)	20 (12)	16 (9)	18 (12)	91 (11)
- Missing	3 (2)	4 (2)	10 (6)	4 (2)	2 (1)	23 (3)
- Total	159	207	169	172	157	864

Incidence of needlestick injuries

The incidence of needlestick injuries varied from one hundred and fifty seven (N=157) in 2017 to two hundred and seven (N=207) in 2014. The year the legislation was introduced in Ireland was the year with the highest recorded incidence of needlestick injuries.

Figure 1: Total number of needlestick injuries per year



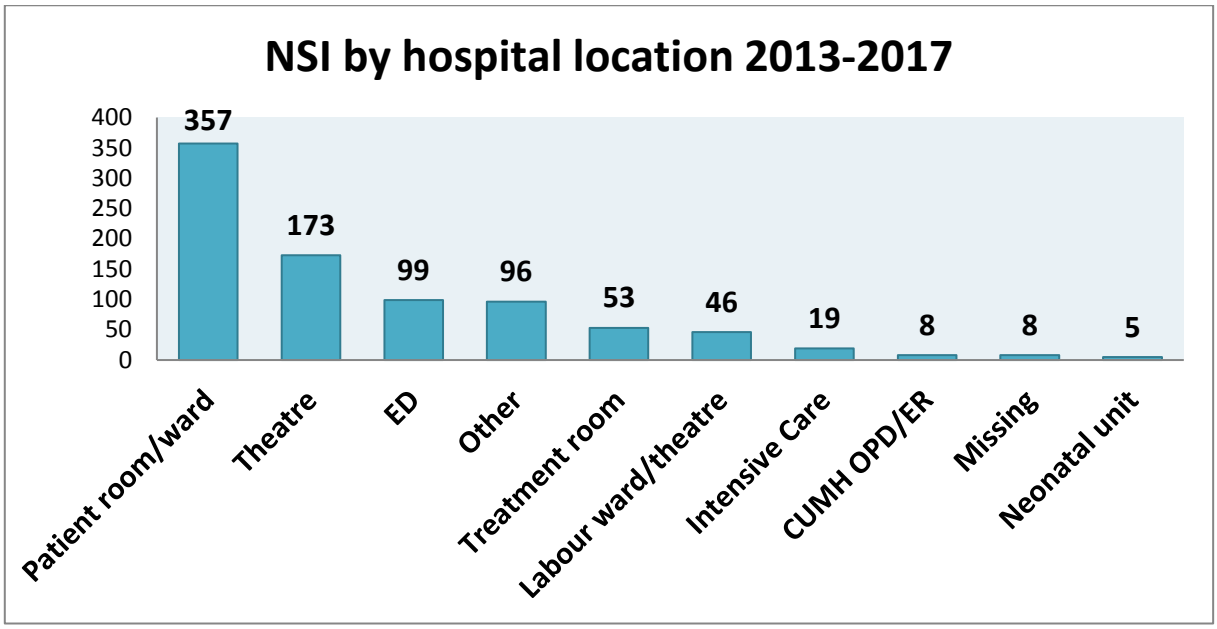
Job category of staff member who sustained the needlestick injury

Nurses and doctors sustained the highest number of needlestick injuries. They accounted for seventy eight percent (78%) of all recorded sharps injuries. Support staff had the third highest incidence of needlestick injuries (13%).

Hospital location where the needlestick injury occurred

The patient's room/ward was consistently the area with the highest incidence of needlestick injuries (41%). The location with the second highest incidence of needlestick injuries was theatre (20%). The Emergency Department and 'Other' location accounted for twelve percent (12%) and eleven percent (11%) of needlestick injuries respectively. 'Other' location included laboratories, mortuary, utility and service areas.

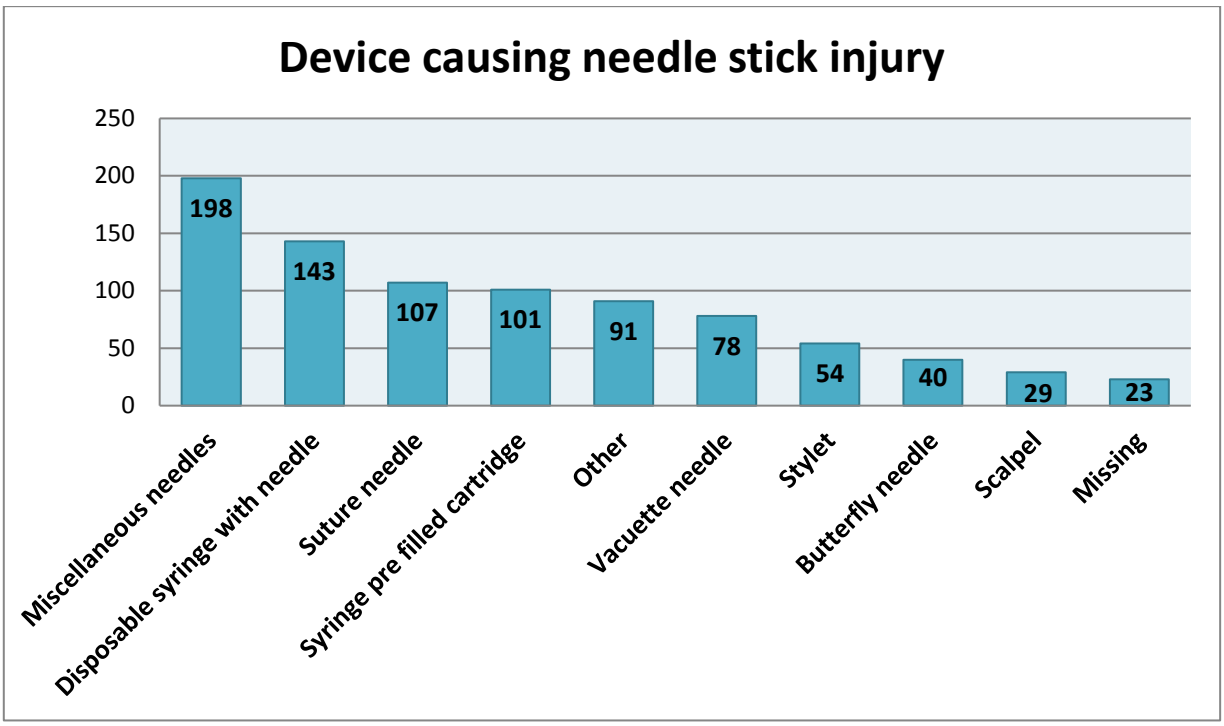
Figure 2: Needlestick injuries by hospital location 2013-2017



Device which caused the needlestick injury

The category in which the highest incidence of needlestick injuries occurred was 'miscellaneous needles' (23%). This category included glucometer needles, needles on IV tubing, unattached hypodermic needles, spinal/epidural needles, arterial catheter introducer and 'unidentified needle type'. They caused the highest number of sharps injuries the year the regulations were introduced. 'Disposable syringes with needles' caused the second highest incidence of sharps injuries (17%). Suture needles (12%) and syringes with pre-filled cartridges (12%) also accounted for a large number of needlestick injuries. 'Other' devices included sharp theatre items, wire, scissors, drill bit, staples, razor and unknown devices.

Figure 3: Needlestick injuries by device 2013-2017



Discussion

Similar to the Cochrane review [10], our study did not find a reduction in needlestick injuries after the introduction of the EU 'Safer Sharps' regulations. Due to study design we could not determine if this was a result of limited benefit from safer sharps or an increased awareness and reporting by staff during this time period. Enhanced awareness and reporting could lead to an underestimate of the true effect of safety engineered devices.

Nurses and doctors had the most sharps injuries. Worryingly, support staff had the third highest incidence. Support staff includes cleaners, porters and catering staff. Lu et al [11] postulated that this category of staff is unlikely to benefit from the use of safer sharps. Support staff should never receive a sharps injury as they don't use sharps directly. This result highlights the importance of correct use and disposal of sharp devices by healthcare workers who use them.

The patient's room or ward was the hospital area where most of the needlestick injuries occurred. Research in Canada reported that theatre was the area of the hospital with the highest incidence of sharps injuries [11]. Our study did not identify the number of procedures involving sharps carried out in each of the different locations. Differences in our results from other studies may be due to alternative clinical practices, staff to patient ratios, number of procedures performed and bed turnover.

'Miscellaneous needles' was the category of device which was responsible for most needlestick injuries. This category included a varied number of medical devices (e.g. glucometer needles, spinal/epidural needles, arterial catheter introducer). Due to the wide spectrum of sharps that were included in this category, it was less likely that these were safety engineered devices. The second highest category 'disposable syringe with needle' which had safety engineered mechanisms available, caused over twenty percent (20%) of sharps injuries prior to the regulations but twelve to fifteen percent (12%-15%) of sharps injuries after the implementation of the regulations. The third highest category of device causing sharps injuries was 'suture needles'. Blunt tip suture needles are recommended by the National Institute of Occupational Health and Safety to reduce the risk of needle stick injuries to surgical personnel [12], however, these devices were not available in the four hospitals in our study. The fourth highest category causing sharps injuries was 'syringe with pre-filled cartridge'. This category included insulin and heparin injections. Safety engineered devices were not available for this category in the four hospitals studied until after 2017.

Our study had several strengths. This question had not been previously examined in Ireland. Also, the large sample size from the inclusion of four hospitals' records over a five-year period added power and plausibility to the findings.

However, the study also had limitations which were primarily due to the study design. We could not eliminate selection and recall bias. Records were only available from healthcare staff who reported a Blood/Bodily Fluid exposure. Research has shown that not all needlestick injuries are reported [13, 14]. Secondly the study may have had confounders which were not adjusted; the higher incidence of needlestick injuries in 2014 may have been due to increased reporting by staff following the introduction of safer sharps. Our study did not account for this potential confounder. Finally, the study was limited by the use of secondary data. As the data had been collected for an alternative reason to this research, we had no control over the variables recorded and as a result some information was not available (e.g. whether the instrument was a safety device or not). One hospital had to be excluded from the study as they did not record information on the instrument that caused the needlestick injury.

Findings from our study strengthen the conclusions from Dulon[2] and Van der Molen[9] who recommended regular training of healthcare workers who use sharps in combination with the use of safety engineered devices.

Future research should include prospective studies which identify safety engineered devices and their benefit prior to and after training of healthcare workers and sharps awareness programmes.

Acknowledgements:
We would like to thank the Occupational health Nurses and administrative staff in Cork University Hospital, Cork University Maternity Hospital, University Hospital Kerry and the Mercy University Hospital for their assistance in collecting the data used in this research.

Declaration of Conflicts of Interest:
The authors declare that there is no conflict of interest

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