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Research Article

Impact of the Use of Safety Engineered Devices on the Rate of Needle Stick Injuries Caused by a Needle on a Disposable Syringe Among Emergency Nurses in Egypt

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Abstract

Background: Due to the recognition of risks associated with NSIs, safety strategies have been adopted to lessen the risk of injury and have shown to be effective in reducing NSIs.

Methods: Eight university hospitals reporting the highest rates of NSIs (Phase 1) were selected for the intervention (Phase 2). Sharp injury protection syringes were supplied, and training on the use of safety devices was conducted. Questionnaires were re-administered post-intervention, focusing on injuries due to needles on disposable syringes.

Results: Injury rates of at least one injury due to needle on disposable syringe in the past three months were significantly reduced from 30.3/100 person in phase 1 to 2.16/100 person in phase 2 (P-value < 0.0001).

Conclusions: Results show that interventions using both educational training on universal precautions and safe work practices as well as the use of sharp injury protection syringes lead to reductions in NSIs among nurses. This is the first study that assessed the risk of needle on a disposable syringe in particular, followed by the implementation of safety engineered devices in attempt to lessen the risk of injury. Evaluations of safety interventions of this sort, across other departments of hospital units and among other personnel are needed.

Keywords: Needlestick Injuries; Needle on Disposable Syringe; Safety Devices; Nurses

Abbreviations

HBV: Hepatitis B Virus; HCV: Hepatitis C Virus; HIV: Human Immunodeficiency Virus; NSI: Needlestick Injury

Introduction

Healthcare workers are frequently introduced to blood borne pathogen infections through common occupational injuries. More than 20 blood borne pathogens can be transmitted from contaminated needles or sharps. Hepatitis B (HBV) and C (HCV), and human immunodeficiency virus (HIV) are the pathogens of our highest concern since they may lead to significant morbidity [1,2]. Nurses being responsible for many high risk activities are the most susceptible occupation group exposed to needle stick injuries (NSIs) and are the ones who mostly suffer from such injuries [3,4].

Due to the recognition of risks associated with NSIs, several safety strategies have been adopted to lessen the risk of injury. These safeguards include interventional strategies as well as educational trainings designed to decrease healthcare occupational injuries by implementing safe work practices. An integrative review of the literature on studies adopting educational and safeguard interventional practices have shown effective results in reducing the risk of NSIs [5].

NSIs due to a needle on a disposable syringe are very common among health care workers in most university hospitals in Egypt. Approximately 30% of healthcare workers reported such a needlestick injury in the past three months, with the actual rates expected to be even higher since underreporting of such injuries is very common (30 - 96%) [6]. Moreover, using Kane's prediction model, it was estimated that health care workers in Egypt acquire 24,004 HCV and 8617 HBV new infections annually [7]. Considering the high occurrence of sharps injuries and the high risk of bloodborne pathogen infection in Egypt, the implementation of safety measures among university hospitals in Egypt is of high priority.

The current study is an interventional arm to a cross-sectional baseline study that aimed at assessing the rates of sharps injuries among nurses across several university hospitals in Egypt (Ismail., *et al*. unpublished observations). Preventive safety measures were implemented among selected university hospitals reporting high risk of NSIs from phase 1 and the effectiveness of these safety measures are reported here.

Methods

Eight university hospitals reporting the highest rates of needle stick injuries in a baseline phase were selected for the intervention. Sharp injury protection syringes (with BD Eclipse™ needle) were supplied to all departments enrolled, with 20% extra amounts to ensure the exclusive use of safe devices among nurses. Also, training on the use of these safety devices was conducted at all sites. The same self-administered questionnaire used in phase 1 was re-administered to the study population of nurses, post-intervention, yet this time focusing mainly on injuries caused by "needles on disposable syringes" in the past three months. A written informed consent was signed by all enrolled nurses after explanation of the study and IRB approval was obtained from the research ethics committee of the Faculty of Medicine at Ain Shams University, Egypt.

The data were coded and entered using the statistical package SPSS version 24. The rates of injuries in the past 3 months, post administering the use of safety devices, were calculated and compared to rates of injuries at phase 1. Additional data on the history of each NSI incident (who was the user of the device causing the injury, when the injury occurred and the rate of reporting an injury to the infection control team.) occurring in the past 3 months was also summarized using numbers and percentages. A P-value less than or equal to 0.05 was considered statistically significant.

Results

Following safety intervention measures, 555 nurses were enrolled for follow up (phase 2) from the 8 selected hospitals. Accordingly, data from 717 nurses from the same hospitals in phase 1 were retrieved for comparison purposes.

Injury rates of at least one injury due to a needle on disposable syringe in the past three months were significantly reduced from 30.3/100 person (217/717) in phase 1 to 2.16/100 person (12/555) in phase 2 (P-value <0.0001) (Figure 1). Moreover, the maximum number of injuries that happened to the same nurse due to a needle on a disposable syringe in the past three months decreased from three injuries in Phase 1 to a maximum of two injuries in phase 2, although the average stayed the same at 1.33Among those who sustained a sharps injury in phase 2, 37.5% occurred before using/preparing to use the device (Table 1).

Most NSI's reported were still caused by the user him/herself, yet this rate decreased from phase 1 to phase 2 (92.7% to 68.8%). Reporting of injuries occurring was still lacking, with only 18.8% of injuries reported to the infection control team.

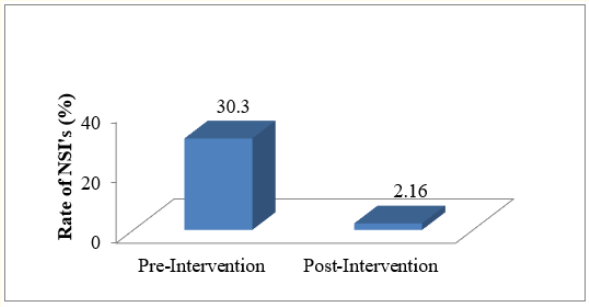

Figure 1: Rate of NSIs in the past three months Pre and Post Intervention.

	n (%)
Before using/preparing to use device (item broke/slipped, etc.)	6 (37.5)
Other (after use-before disposal, on the way to the trash, etc.)	3 (18.8)
Between steps of a multi-step procedure (passing, etc.)	2 (12.5)
During use of the device (item slipped, patient jarred item, etc.)	2 (12.5)
While putting item into disposal container	1 (6.3)
Total	16 (100.0)

Table 1: When NSI injuries occurred.

Discussion

To our knowledge, this is the first study that assessed the risk of needle on a disposable syringe in particular, followed by the implementation of safety engineered devices in attempt to lessen the risk of injury. Among all health care personnel, nurses are the most susceptible to suffer from needle stick injuries [8]. Accordingly, all the available emergency department nurses on shift during the respective times of the study (Phase 1 and Phase 2), from the eight university hospitals reporting high risk of needle stick injuries were selected and enrolled for the study.

Results show that interventions using both educational training on universal precautions and safe work practices as well as the use of sharp injury protection syringes lead to reductions in needle stick injuries among health care workers. Injuries in the past three months significantly dropped from 30.3 in phase one to 2.16 per 100 persons in phase two respectively. This is in line with another study from Egypt that has reported a significant drop from 36.9 to 12.4 injuries per 100 persons [9].

However, although study results are promising, the generalizability of these results are limited since the study included only one hospital department (the Emergency Room) and one brand of safety device. More so, despite the trainings and safety measures administered, some errors still occurred especially before using/preparing the use of the devices in which case the use of safety device would not help (37.5% of sustained sharp injuries in phase 2). Results also show that underreporting of injuries to the infection control team remains an issue even post intervention.

Conclusion

Despite these limitations, the current study represents a step forward in research since it encompassed an intervention that combined both educational product trainings and safety engineered devices. It is recommended that educational sessions on safety measures are provided to all health care staff regularly, alongside providing health care units with cost-effective safety devices to minimize health care workers exposure to blood-borne pathogens. In future research, evaluations of safety interventions of this sort, across other departments of hospital units and among other hospital personnel are needed.

Ethics Approval and Consent to Participate

- IRB approval for this research study was obtained from the research ethics committee of the Faculty of Medicine at Ain Shams University, Egypt.
- A written informed consent was signed by all enrolled nurses after explanation of the study.

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing Interests

Not applicable.

Funding

Not applicable.

Author's Contributions

IG contributed to the conception and design of the work, interpretation of data, reviewing the manuscript and approving the submitted version. NA contributed to interpretation of data, re-

viewing the manuscript and approving the submitted version. GS contributed to interpretation of data, reviewing the manuscript and approving the submitted version. BR contributed to interpretation of data, reviewing the manuscript and approving the submitted version. EA contributed to interpretation of data, reviewing the manuscript and approving the submitted version. AA contributed to interpretation of data, reviewing the manuscript and approving the submitted version. EE contributed to interpretation of data, reviewing the manuscript and approving the submitted version. EM contributed to interpretation of data, reviewing the manuscript and approving the submitted version. HA contributed to interpretation of data, reviewing the manuscript and approving the submitted version. AH contributed to interpretation of data, reviewing the manuscript and approving the submitted version.

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