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Study of Impact of Implementation of Quality Care Bundle for Needle Stick Injury in Tertiary Care Centre

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Abstract:
This hospital-based prospective interventional qualitative study examined the effect of care bundle implementation on needle stick injuries (NSIs) among 500 healthcare workers (HCWs). The inclusion criterion encompassed sharp injuries sustained during working hours, while injuries outside the hospital were excluded. Conducted in two phases, the study included pre-intervention and post-intervention periods of 6 months each. Interventions comprised classroom presentations, pre/post-lecture assessments, onsite training, and care bundle implementation. Results showed a 50% reduction in NSIs (120 to 60 cases, p=0.0001) and a halving of incidence rates (2.4 to 1.2 per 100 HCWs/month). Additionally, reporting rates improved from 70% to 90%. The findings underscore the efficacy of care bundle interventions in enhancing occupational safety, reducing NSIs, and promoting better reporting practices, thereby mitigating bloodborne pathogen risks among HCWs.

Keywords: Needle Stick Injuries, Care Bundle, Healthcare Workers, Interventional Study, Occupational Safety, Reporting Rates.

INTRODUCTION

Introduction A needle stick injury (NSI), percutaneous injury, or percutaneous exposure incident is the penetration of skin by a needle or other sharp object, which was in contact with blood, tissue, or other body fluid before the exposure.[1]

Since NSI carries risk of transmitting blood-borne diseases, it needs to be monitored, documented and investigated. Data from the Exposure Prevention Information Network (EPINet) system suggest that, on an average, hospital workers incur approximately 27 NSI per 100 beds per year.[2]

WHO reports in the World Health Report 2002, that of the 35 million health-care workers, 2.0 million experience percutaneous exposure to infectious diseases each year, 37.6% of Hepatitis B, 39% of Hepatitis C and 4.4% of HIV/AIDS in Health Care Workers around the world are due to needle stick injuries. The

two most common causes of NSIs are two handed recapping and the unsafe collection and disposal of sharps waste.[3]

Hence this study was conducted to determine outcomes of implementation of quality care bundle for prevention of needle stick injuries. By understanding the impact of QI strategies on infection rates within Indian hospitals, healthcare leaders can make informed decisions to enhance patient safety. Through collaborative efforts, we can create a safer healthcare environment and reduce the burden of hospital-acquired infections in India.

MATERIAL AND METHODS: -

AIM AND OBJECTIVES OF THE STUDY:

- To determine the prevalence of NSI in a tertiary care hospital.
- To determine the effectiveness of application of quality indicator in reduction of NSI in a tertiary care hospital.

RESEARCH METHODOLOGY

This is an hospital based prospective interventional Qualitative study with study population being health care workers working in the institute during the period of study

Inclusion And Exclusion Criteria's

Inclusion: all sharp injuries sustained by health care workers during working hours

Exclusion: injuries occurring outside the hospital

The study was carried in 2 parts including analysis before intervention, intervention and after intervention phases, phase 1 included a 6-month pre intervention from June 2021 to November 2021, phase of intervention and phase 2 included the post-intervention phase of 6 months duration February 2022 to July 2022. Phase 1 - records of patient with NSI was be noted during the prescribed time period among the study population. The intervention included organizing classroom presentations, pre and post-test lecture and demonstration, Onsite trainings for collection as well as processing of sample Implementation of care bundles to the clinician and other health care workers was done in batches of 15 participants as mentioned below.

Training Period for Each Batch 3 Hours

Topics Included in Training

- Overview of Needle Stick Injuries (NSIs)
- Importance of Preventing NSIs
- Introduction to Care Bundles
- Safe Handling of Needles
- Use of Safety-Engineered Devices
- Prevention Strategies
- Safe Practices During Use
- Post-Use Procedures
- Proper Disposal
- Reporting and Monitoring

After intervention the study was continued as phase 2 during which cases of CAUTI, VAP, SSI and NSI were noted and compared with data of phase 1.

Predesigned, pretested and validated proforma was used to collect the data from case files and treatment record of the patients

The study was conducted at Index Medical College Hospital, Indore after during the period 1st June 2021 to 31st July 2022 after obtaining approval from the Institutional Research Ethical Committee and written consent from patient's attendants/relatives.

All the data recorded was recorded by pretested and validated proforma from the case sheets and treatment records of the patients.

All the data recorded was collected and tabulated under different categories in MS Excel windows 11 and same was used for the analysis by different tests of statistics to draw conclusion by using SSPS version 21 software. The data was analysed with respect to rate and percentage as applicable. Paired t test was used to calculate statistical significance where $P<0.05$ was considered as level of statistical significance.

OPERATIONAL DEFINITIONS FOR THE STUDY

1. **Needle Stick Injuries (NSI)**: A percutaneous injury caused by needles or sharp objects that are contaminated with blood or other potentially infectious materials.
2. **Incidence Rate of NSI:** The number of needle stick injuries per 100 healthcare workers (HCWs) per month.
3. **Reporting Rate:** The proportion of NSI incidents that are reported by healthcare workers, measured as a percentage.
4. **Needlestick injury rate** = Number of needle stick injury reported x 100
5. Total patient days in that period

Observations and Results

A total of 500 health care workers were included in the study and cases of NSI reported by them were analysed. The result of impact of implementations of care bundle on needle stick injuries are as follows:

Table 1: Demographic distribution of cases of NSI.

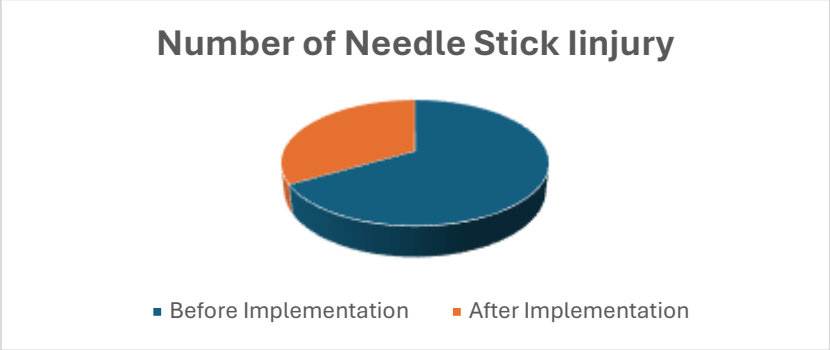
Category	**Number of Patients**
Total	500 HCWs
Gender Distribution	
Male	300 HCWs
Female	200 HCWs
Age Distribution	
Under 30	100 HCWs
30-50	250 HCWs
Over 50	150 HCWs
Department of distribution	
Surgery	150 HCWs
General medicine	100 HCWs
Paediatrics	50 HCWs
Other departments	200 HCWs

Table 2: Number of NSI, incidence rate and reporting rate of NSI in hospital

P value for NSI incidence rate is 0.0001.

Category	Before Implementation	After Implementation	Reduction (%)
Number of NSIs	120	60	50%
Incidence Rate (per 100 HCWs/month)	2.4	1.2	50%
Reporting Rate	70%	90%	-

Figure 1: Number of needle stick injury before and after implementation of care bundle



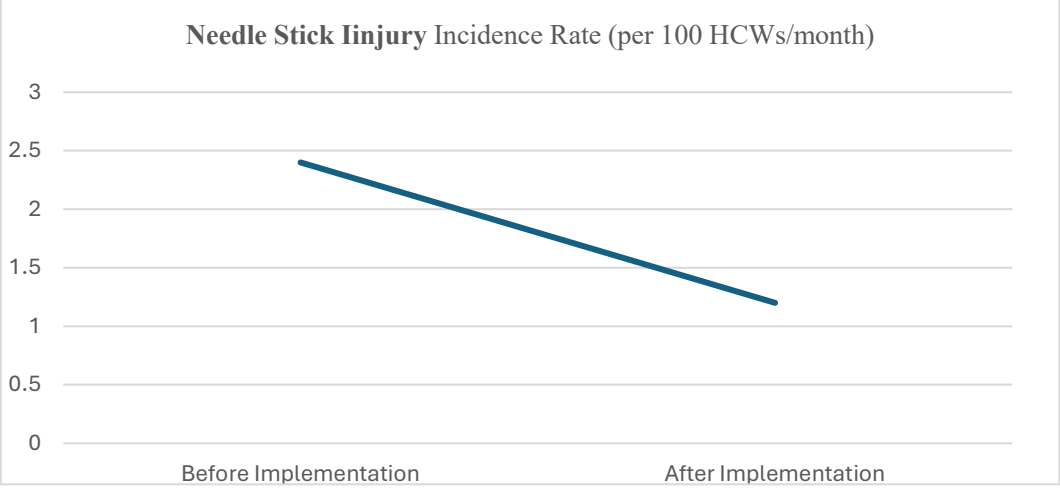
- Before Implementation: 120 NSIs
- After Implementation: 60 NSIs
- Reduction (%): 50%

The number of NSIs saw a significant reduction from 120 to 60, (50% decrease).

This substantial reduction indicates the effectiveness of the interventions in minimizing the occurrence of needle stick injuries.

Such a decrease can lead to a safer working environment for healthcare workers and reduce the risk of tr ansmission of bloodborne pathogens

Figure 2: Incidence of needle stick injury before and after implementation of care bundle



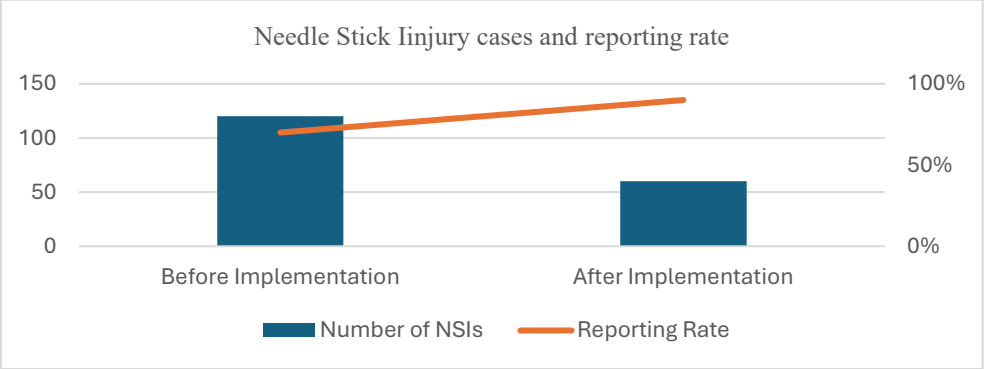
Incidence Rate (per 100 HCWs/month)

- Before Implementation: 2.4 per 100 HCWs/month
- After Implementation: 1.2 per 100 HCWs/month
- Reduction (%): 50%

The incidence rate of NSIs per 100 HCWs per month was halved from 2.4 to 1.2

This 50% reduction in the incidence rate further supports the positive impact of the interventions. P value for NSI incidence rate is 0.0001 suggestive of statistically significant reduction of NSI incidence rate.

Figure 3: Reporting and number of cases of needle stick injury before and after implementation of care bundle



Reporting Rate

- Before Implementation: 70%
- After Implementation: 90%
- Increase: 20 percentage points

The reporting rate for NSIs increased from 70% to 90%, a 20 % improvement.

This rise in reporting indicates that healthcare workers are more likely to report needle stick injuries, whi ch is crucial for proper monitoring and prevention.

A higher reporting rate suggets increased awareness and compliance with reporting protocolenabling bet ter tracking of incidens and more effective implementation of safety measures.

DISCUSSION

This study analysed the impact of a care bundle implementation on needle stick injuries (NSIs) among 500 healthcare workers (HCWs). The results showed significant improvements post-implementation in terms of reduced NSIs, decreased incidence rate, and increased reporting rate. Comparing these findings with those from studies by Zvanaka Sithole[10] (2018), Varun Goel[4] (2017), and Neha Dang[5] (2019), Bharti PP[6] (2022), Naganjan K S B[8] (2023) and Latika R S[7] (2024) provides a comprehensive understanding of the effectiveness of such interventions.

Number of Needle Stick Injuries (NSIs)

The implementation of the care bundle resulted in a significant reduction in the number of NSIs, from 120 to 60, marking a 50% decrease. This substantial reduction is crucial as it directly correlates with improved safety for healthcare workers. Zvanaka Sithole[10] (2018) reported an even more remarkable reduction, from 0.97 NSIs per month to 0.17 NSIs per month, an 82% decrease. Zvanaka Sithole[10] highlighted the

importance of training and proper sharps disposal, which align with the components of our care bundle. Similarly, Varun Goel[4] (2017) identified doctors, especially resident doctors, as a high-risk group for NSIs and emphasized the importance of personal protective equipment and immediate first-aid measures. Our study's results demonstrate the effectiveness of comprehensive care bundles in significantly reducing NSIs among diverse healthcare worker populations.

Incidence Rate of NSIs

The incidence rate of NSIs per 100 HCWs per month decreased from 2.4 to 1.2, demonstrating a 50% reduction. This substantial decrease mirrors the findings of Neha Dang[5] (2019), who reported a reduction in NSI incidence rate from 1.19 to 0.63 per 1,000 patient days (47.06%). Although the measurement metrics differ, the outcomes highlight similar trends of significant improvement post-intervention. Both studies emphasize the importance of continuous training, regular audits, and the appropriate use of safety devices to achieve these results. Varun Goel's[4] study (2017) further supports the importance of timely reporting and preventive measures in reducing NSI incidence.

'Reporting Rate

The reporting rate for NSIs increased from 70% to 90%, indicating a 20 percentage point improvement. This increase is crucial as it reflects heightened awareness and adherence to reporting protocols among healthcare workers. While Neha Dang[5] (2019) focused more on intervention measures rather than reporting rates, the improved adherence to protocols observed in our study highlights the effectiveness of continuous education and training. Varun Goel's study (2017) similarly emphasized the importance of timely reporting, with most HCWs reporting exposures on the same working day. The increased reporting rate in our study underscores the success of the care bundle in fostering a culture of safety and transparency.

Further, Bharti PP[6] (2022) surveyed 330 staff nurses with a mean age of 31.59 years, predominantly female (64.9%) and junior staff nurses (72.2%). Latika R S[7] (2024) studied 330 staff nurses, mostly aged 20-30 years (74.63%), and predominantly female (72.40%). Naganjan K S B[8] (2023) did not provide specific demographic details. Your study included 500 healthcare workers, with a majority being male (60%) and aged 30-50 years (50%). Padma Bhatia[9] (2018) Reported 30.8 ±10.05 years as mean age of study population with 75.9% of participants being males.

Bharti PP[6] (2022) reported a 66.7% prevalence rate of NSIs, with higher risks during evening shifts and intravenous procedures. Latika R S[7] (2024) found a significant NSI prevalence of approximately 74%, with high workload and lack of sleep being major contributors. Naganjan K S B[8] (2023) observed a reduction in NSI rates from 50.8% in 2021-2022 to 36.4% in 2022-2023, citing IV cannula insertion and garbage bag handling as major causes. Your study saw a 50% reduction in NSIs, with the number of NSIs decreasing from 120 to 60 and the incidence rate halving from 2.4 to 1.2 per 100 healthcare workers per month.

Bharti PP[6] (2022) emphasized the importance of awareness and adherence to universal precautions. Latika R S[7] (2024) highlighted training on biomedical waste management (77%) and the recognition of NSI preventability (96%). Naganjan K S B[8] (2023) attributed the significant reduction in NSIs to interventions focusing on proper handling of sharps and adherence to protocols. Your study's care bundle implementation led to a 50% reduction in NSIs and a 20 percentage point increase in the reporting rate, from 70% to 90%. As observed by Padma Bhatia only 3.0% participants were not using any precautions

while handling healthcare waste while 44.5% participants knew that NSI during BMW handling can cause Hepatitis and 54.0% participants had knowledge that it can lead to HIV infection.

Zvanaka Sithole[10] (2018) reported an 82% reduction in NSI incidence, highlighting the importance of training and proper sharps disposal. Varun Goel[4] (2017) identified doctors as a high-risk group and emphasized the use of personal protective equipment and timely reporting. Neha Dang[5] (2019) reported a 47.06% reduction in NSI incidence rate per 1,000 patient days, emphasizing continuous training, appropriate use of safety devices, and regular audits.

The findings from your study align well with previous research, reinforcing the effectiveness of care bundle implementations in reducing NSI incidence and improving reporting rates. The 50% reduction in NSI incidence observed in your study is consistent with the significant reductions noted by Sithole, Goel[4], and Dang[5]. Continuous education, proper sharps disposal, adherence to best practices, and regular monitoring are essential to sustain these improvements and ensure the safety of healthcare workers. The increased reporting rate suggests heightened awareness and compliance with safety protocols, enabling better tracking of incidents and more effective implementation of preventive measures. Tailored interventions are crucial to addressing the specific needs of different healthcare worker populations effectively.

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