Implementation of a Safety Campaign to Reduce the Rate of Needlestick Injuries

Shaunta J. Chapple

Under Supervision of

Kimberly Callender

Second Reader

Debra Bingham

A DNP Project Manuscript
Submitted in Partial Fulfillment of the Requirements for the
Doctor of Nursing Practice Degree

School of Nursing, University of Maryland at Baltimore
May 2021

Abstract

Problem and Purpose: Needlestick injuries are the most common cause of work-related bloodborne pathogen exposure among nurses. At the project site, 62.5% of preventable needlestick injuries reported during the first half of FY 20 were associated with failure to appropriately activate the safety mechanism on safety engineered devices (SEDs). A DNP project was implemented to reduce the rate of preventable needlestick injuries among inpatient nursing staff.

Methods: Implementation strategies and tactics utilized were pre- and post-implementation surveys; visual cues; sharp safety huddles; revised new employee orientation; and assignment of an educational, post-injury module to staff. The number of preventable needlestick injuries was tracked during the data collection period; supplemental data included the unit, date and time of incident, hire date, and brief narrative. The number of inpatient nursing units that displayed the visual cue (n=20); the number of inpatient nursing units on which a formal/informal sharp safety huddle was held (n=13); the number of nurses who attended the revised new employee orientation (n=139); and the number of nurses who completed the post-injury module (n=3) was also tracked.

Results and Conclusion: Pre-implementation survey data revealed 63% of respondents believed preventable needlesticks were a present concern within their organization (n=76) and 71% believed injuries were likely caused by inappropriate safety mechanism activation (n=86). In comparing pre- and post-implementation data, there were decreases in the percentages of staff who expressed that they disagreed or strongly disagreed with statements intended to measure knowledge about Safety Engineered Devices (SEDs), processes, and education. 95% (n=20) of inpatient nursing units displayed the visual cue during the implementation period. The baseline needlestick injury rate of 0.47 consistently decreased during the implementation period: October: 0.34; November: 0.12; and December 0.2. Needlestick injuries continue to be an occupational hazard for nursing staff, especially during a period of mass vaccination/widespread use of needles during the COVID-19 pandemic. A multifaceted approach including open dialogue with staff, promoting a consistent method for safety mechanism activation, increasing awareness, and ongoing staff education appeared to be associated with a reduced rate of needlestick injuries among inpatient nurses.

Introduction

Registered Nurses are on the frontline of patient care, putting them at greater risk for needlestick injuries. The Centers for Disease Control and Prevention estimate 385,000 needlesticks and other sharps-related injuries among healthcare workers in the hospital setting each year (CDC, 2015). The International Safety Center’s Exposure Prevention Information Network (EPINet) reports that of 1,175 records collected between January and December 2018, 409, or 34.8% of needlesticks and sharps injuries were incurred by nurses, representing the largest percentage per job category (International Safety Center, 2018). Reasons that nurses are susceptible to needlestick injuries include fewer nurses than patients, fatigue from working long shifts, and lack of awareness of the prevalence and implications of the problem (Kargrin & Aykol, 2016).

Needlesticks are a problem that disproportionately affects nursing staff at the project site. The Occupational Safety and Health Administration (OSHA) requires employers to maintain a sharps injury log that provides details about needlestick injuries, including information about the injury, the type and brand of the device involved, the work area where the injury occurred, and an explanation of how the injury occurred (OSHA, n.d.). Data collected revealed that the cause of needlestick injuries among nursing staff is most often related to a failure to engage or adequately engage the safety mechanism on safety-engineered devices (Personal Communication, J.N., 23 December 2019). During the first half of FY 20, a total of eight Registered Nurses employed by the project site incurred a needlestick injury; five of them (62.5%) were caused by the nurse’s failure to engage or adequately engage the safety mechanism.

The purpose of this DNP project was to implement a multi-faceted safety campaign to reduce the rate of needlestick injuries in inpatient nursing staff.

Evidence Review

Yang and Mullan (2011) found that both safeguard interventions and educational training effectively reduce the risk of needlestick injuries. Rajkumari, Mathur, Gunjiyal, & Misra (2015) concluded that sharps safety awareness classes and hands on practice with safety-engineered devices are useful in spreading awareness and improving the knowledge to address sharps injuries/needlesticks/splashes. The authors recommend pairing routine education with compulsory hepatitis B virus vaccination.

Black (2013) identified that in addition to careful selection and implementation of appropriate safety engineered device designs, users' ongoing education regarding accurate activation techniques is critical to an effective sharp injury prevention program. The author also noted that education should include didactic instruction and hands-on practice with these devices at device implementation and on a recurring basis, especially for those used less often. (2013) notes that passive devices represent a small portion of safety-engineered devices in use, and that greater adoption of these devices and continual education of end users is also essential to effective sharps injury prevention programs.

Chambers, Mustard, Holness, Nichol, & Breslin (2015) found that hospitals can implement small changes to continue to enhance prevention like taking advantage of opportunities to increase awareness and identifying opportunities for prevention. The authors also discussed how regulatory standards alone have not effectively decreased sharps injuries, and renewed commitment of hospitals is needed to achieve further progress.

Reflected across the literature is the need to take a multi-faceted approach to addressing the problem of needlestick injuries among nurses. Adoption of safety engineered devices is a step in the right direction, but this must be paired with targeted, ongoing education and dialogue.

Theoretical Framework

The middle range theory that guided implementation of this practice change, supported predictions about the planned behavior, and facilitated understanding of factors that influenced outcomes was Azjen's Theory of Planned Behavior. The clinical problem of focus was the number of needlestick injuries among Registered Nurses (RNs) working on inpatient units. This theory discussed attitudes, behavioral intention, subjective norms, perceived power, and perceived behavior control. Regarding attitudes, the theory helped guide the evaluation of the degree to which RNs working on inpatient units at the medical center had favorable or unfavorable thoughts about the behaviors of interest; those behaviors were using the thumb to activate the safety mechanism on SEDS and participating in unit-based safety huddles focused on sharps injury awareness. Here, the outcome of RNs performing the behaviors was considered. The theory guided our understanding of behavioral intention, where motivational factors that influenced how RNs engaged the safety mechanism on SEDs and participated in unit-based safety huddles were identified.

The theory of planned behavior supported the quest to provide context and meaning to subjective and social norms amongst inpatient RNs within the medical center in regard to the general consensus on whether the intended behaviors are approved or disapproved, and whether stakeholders and leaders believed RNs should engage in the intended behaviors. The theory provided overarching support that highlighted standard norms amongst nurses as it related to prevention of sharps injuries and bloodborne pathogen exposure. In addition, the theory helped to guide our evaluation of perceived power and behavioral control.

Methods

The project setting can be described as a 389-bed hospital. 21 inpatient nursing units were involved in the DNP project: ED; Pediatrics; Observation; Endoscopy; PCU; Short Stay; Procedural Care; Interventional Radiology; Cath Lab; ICU/IMU; HVU; 4 Medical; Oncology; NSU; JSC; GSU; MSU; ACE; NICU; Labor & Delivery; and Mother/Baby. The target population was nursing staff (Registered Nurses). Outpatient and surgical areas were excluded from this project. Agency staff, providers, and phlebotomists were also excluded from the project.

Several implementation strategies and tactics were employed to foster buy-in and acceptance of the change. Formal commitments were obtained early on and potential solutions pertaining to the clinical problem were solicited from clinical leaders and staff and integrated into the project. The Checklist to Assess Organization Readiness for Evidence-Informed Practice (CARI) assessment was completed to assess for organizational readiness and to identify barriers to and facilitators of the project interventions. Incentives were offered for participation in surveys. Meetings were held periodically to ensure that stakeholders were up to date on the status of the project and the status of goal attainment. The visual cues were designed to remind clinicians about the project and interventions (Figure E1). Nursing leadership was leveraged to mandate change and adoption of new processes. Educational outreach sessions were conducted in the form of the sharp safety huddles and impromptu visits to the nursing units.

Email communication about the FY20 Sharp Safety Campaign, “Thumbs Up for Safety” was sent to the clinical manager of each inpatient unit to introduce the quality improvement project. A 10-question pre-implementation survey of inpatient nursing staff was conducted using a 5-point Likert scale to evaluate knowledge and attitudes related to needlestick injury incidence, procedures, and education (Appendix C). Participation in the survey was solicited by offering a lunch award to the unit with the highest survey completion rate.

Sharp Safety huddles were led by the sharp safety coordinator and/or DNP student to introduce the safety campaign, reinforce sharp safety practices, and educate staff on the new work practice control: thumb activation of the safety mechanism. While it was intended that at least one formal safety huddle be held on each inpatient unit, only 19% (n=4) of inpatient units had a formal sharp safety huddle conducted by the sharp safety coordinator, and 43% (n=9) of units had informal sharp safety huddles facilitated by the DNP student, 62% (n=13) in total (Figure F1). The sharp safety huddles were held only on day shift from Monday to Friday. During the huddles, ink pens were distributed that were branded with the safety campaign slogan: “Thumbs Up for Safety!” (Figure E2). Visual cues were produced and posted on the computers on each inpatient nursing unit (Figure E1). The visual cues were developed to remind staff to use one consistent method for activating the safety mechanism on SEDs and contained the campaign slogan “Thumbs Up for Safety!” with a visual depiction of a thumb activating the safety on a disposable syringe. A special message was published on the project site’s internal newsletter to discuss sharp safety and to spread awareness about the safety campaign (Figure E3). A modified version of the visual cue was also included to familiarize staff with the work practice control, thumb activation.

The sharp safety presentation for new employee orientation (NEO) sharp safety presentation was revamped to include updated national sharp safety data; the work practice control of using the thumb of the dominant hand to activate the safety; methods for reducing the occurrence of preventable needlestick injuries; and information about the Sharp Safety Campaign (Appendix D). The revised NEO sharp safety presentation went live on September 16, 2020, the first NEO of September. During the planning phase, it was determined that the presentation would include a pre and post assessment, but this was later shown not to be feasible with the allotment of time during NEO for the sharp safety content.

A module was made available on the project site's learning management system, HealthStream, to be assigned to staff who incurred a preventable needlestick injury with manages involved to encourage completion as necessary, and clinical education engaged to address educational needs. This module was the same module presented during NEO.

Results

The primary goal of the project was achieved: to reduce the rate of preventable needlestick injuries in inpatient nursing staff. The rate of needlestick injuries was the outcome measure used calculated as the total number of inpatient RN needlestick injuries over number of patient days x 1000. This method of calculation was used by the project site before, during, and after project implementation, and has been deemed appropriate by the Centers for Disease Control and Prevention (CDC). Per the CDC, investigators in numerous published studies calculated institution-wide rates of sharps injuries using a variety of denominators, for example, number of occupied beds, number of inpatient days, number of admissions (CDC, 2008, page 49). In August 2020, prior to implementation of the project, the rate of preventable needlestick injuries was the outcome measure used calculated as the total number of inpatient RN needlestick injuries (n=4)/number of patient days (n=8543) x 1000 equaled 0.47. In October, the rate decreased (number of RN needlestick injuries n= 3 /number of patients days n=8723 x 1000) to 0.34, with a double-digit decrease in November (number of RN needlestick injuries n= 1 /number of patients days n=8579 x 1000) with a rate of 0.12. The rate in December held steady at 0 until the final weeks of data collection when there was an increase (number of RN needlestick injuries n= 2 /number of patients days x 1000) to 0.2, still more than fifty percent less than the pre-implementation rate.

The number of inpatient units that displayed the visual cue out of the number of inpatient units involved in the project was one structure measure that was tracked throughout the project (Figure F2). Visual cue posters were displayed in prominent locations on 95% (n=20) of the inpatient nursing units to illustrate safe, accurate engagement of the safety mechanism on SEDs in use within the medical center. Another structure measure for this project included the number of inpatient units that held a formal or informal safety huddle over the total number of inpatient units involved in the project, 62% (n=13). The project fell short of its goal of safety huddles on 100% of the inpatient units. The reasons believed to have contributed to this shortfall include a change in the Clinical Site Rep (CSR) and the COVID-19 pandemic. The first CSR was eager to lead sharp safety huddles as they were a key part of her role and focus as the Sharp Safety Coordinator. Once the new CSR came on board, she maintained a dual role as Sharp Safety Coordinator and Clinical Educator, and this coupled with time spent acclimating to the new role limited her available time. Furthermore, the practices and priorities of the new CSR as the new Sharp Safety Coordinator differed from her predecessor. Units dedicated solely to the care of COVID-19 patients were intentionally not visited by the DNP student as a safety precaution, further impacting the occurrence of safety huddles. In spite of this, the sharp safety huddles that did occur were a part of a larger safety campaign, and collectively, these interventions appeared to increase awareness of sharp safety, provide education, and ultimately helped reduce the rate of needlestick injuries.

Attempts were made to track other structure measures, such as the number of nursing staff who completed the revised NEO over the total number of nurses employed on the inpatient units involved in the project. However, with reportedly unprecedented staff turnover and use of agency staff, information regarding the number of non-agency nurses employed was not readily available or provided. For added context, the number of nurses who completed a revamped NEO from October through December was 139 (October n=41; November n=17; December n=81). These numbers did include agency staff. Alternatively, the number of NEO sessions that included the revamped sharp safety presentation was measured: 100% (n=8) expressed as the number of revamped NEO presentations over the total number of sessions held.

The process measure sought to examine the number of inpatient RNs who completed the post-injury module after incurring a needlestick injury. This measure was calculated as the number of RNs who completed the post-injury module (n=3) over the total number of needlestick injuries that occurred between October and December (n=6), 50%. Technical issues prevented nurses injured in October from completing the post-injury module. Once technical issues were resolved, 100% of nurses who incurred a needlestick injury from November to December completed the assigned post-injury module (n=3). Although determined not to be feasible early in the planning phase of the project due to limited organizational resources, with adequate resources it would have been appropriate to track the number of nurses who used the work practice control (thumb only safety mechanism activation) out of the total number of nurses administering injections as a process measure.

Most of the short-term project goals were met or within acceptable range of the target. Facilitators of the project included leadership support and staff enthusiasm. Staff enthusiasm was not technically measured but gauged by the interactions and conversations between the CSR, DNP student, and staff across all inpatient units. There was verbal report and direct observation of staff enthusiasm about sharp safety and involvement in the project, and verbal staff acceptance of and/or agreement with the potential effectiveness of the work practice control (thumb activation of the safety mechanism). An additional facilitator, though unexpected, was the change in the CSR. The new CSR had a dual role as sharp safety coordinator and clinical education specialist which proved to be invaluable to the project. An unexpected benefit of the project was increased awareness of sharp safety going into a period of mass COVID-19 vaccination efforts at the project site.

The COVID-19 pandemic also served as the greatest project barrier; not to the extent of thwarting the project, but by changing a few aspects of the project such as the ability to conduct unit safety huddles. The low percentage of formal unit huddles conducted is considered one of the most significant problems within the project implementation. There was also low participation in the post-implementation survey compared to pre-survey results, likely due to a shift in how survey results were collected at the suggestion of the CSR (paper vs. QR code). The pre-implementation survey was offered only on paper while the post-implementation survey was made available on paper and via QR code (Figure C1; Figure C2); this may have caused confusion. While the total number of possible survey respondents was not known, a comparison was made between the number of pre-survey responses received (n=120) and the number of post-survey responses received (n=25). The incentive for the unit completing the highest number of surveys did not occur due to COVID limitations on gatherings and shared food.

Perhaps the most significant shortcoming was a failure to involve the clinical education team and sharp safety champions more fully in project implementation. These teams were engaged late in the project after the change in CSR, but earlier involvement may have enhanced the project.

Discussion

Conducting pre and post implementation surveys helped establish staff beliefs and attitudes regarding the reasons for needlestick injuries, available educational resources at the project site, and illustrated whether those attitudes changed or remained the same post-implementation. Holding sharp safety huddles, posting visual cues on the computers used by nursing staff, distributing ink pens branded with the campaign slogan, and having a sharp safety feature in the internal newsletter helped bring awareness to sharp safety and to the goal of decreasing the rate of needlestick injuries on the inpatient units.

By revising new employee orientation and implementing a post-injury educational module, new nursing staff received targeted education on prevention, while those who incurred a needlestick injury received remedial education in the period immediately following the injury. The adoption of a work practice control (thumb activation of the safety mechanism) provided a consistent method for engaging the safety mechanism that allowed greater stability for the user handling a safety engineered device.

These interventions appear to have been successful at reducing the rate of needlestick injuries. This DNP project has mirrored the general results/conclusions from the published evidence. Across the literature, rates of needlestick injuries have declined when work has been done to increase awareness, reeducate staff, and continue prevention efforts beyond the adoption of safety engineered devices. It has also been noted in the literature that the adoption of safety engineered devices alone is not enough, and the project site has demonstrated this with the ongoing issues with needlestick injuries going unresolved until the introduction of the practice changes. Low post-implementation survey rates of completion account for the inability to firmly establish whether the project had an impact on increasing awareness of sharp safety. The number of staff who completed the post-injury education module was lower than expected due to early technical issues with the module that were resolved nearly midway through the data collection period. The project site's culture did not allow for stringent requirements to be placed on the timeframe for completion of the module or physical demonstration/competency validation prior to staff being permitted to resume giving injections as hoped during the planning phase. A personnel change in the Sharp Safety Coordinator position and limitations on student authorization to spend time onsite also contributed to fewer units than initially planned to have a formal sharp safety huddle introducing the project.

Perhaps the greatest limitation of this project is the fact that sharp safety data relies heavily on the willingness of staff to report needlestick injuries, and the accuracy of that which is reported. It is difficult to establish whether rates decreased purely because of the interventions, staff failure to report incidents, or both. This underscores the importance of providing education about the sequelae of bloodborne pathogen exposures.

While the clinical education team and sharp safety champions were leveraged less than hoped during the implementation of this project, each team was an available resource. Larger organizations may find it cumbersome to implement a project on this scale without greater involvement from those teams.

Agency staff were excluded from the numbers when calculating the pre-implementation rate of needlestick injures and during the data collection period. This was because far fewer agency nurses were being utilized at the project site at the time the project was planned, and agency nurses did not complete the same orientation as the nurses employed by the project site. Since that time, use of agency staff has far exceeded previous numbers, and all new nursing staff members presently complete the same new employee orientation

Conclusion

COVID-19 touched down in the United States very early in the planning phase of this project; one could not foresee the unanticipated implications of the project/practice change as related to a global pandemic. The increase in nurse susceptibility to needlestick injury and the surge in the number of needles being manipulated by health care workers during COVID-19 vaccine administration efforts highlight the relevance and timeliness of this project. Pre-pandemic- fatigue, burnout, and high patient-to-nurse ratios contributed to the occurrence of needlestick injuries (Kargrin & Aykol, 2016). The now inflated number of nurses who report feelings of mental and physical exhaustion paired with the staggering number of COVID-19 patients who have overrun nursing units have exacerbated what has long been a precarious clinical problem.

Strengths of this project include affordability, with minimal fiscal resources needed for implementation; ease of sustainability in using annual bloodborne pathogen training as a springboard for expanded education, and translatability of the interventions to outpatient and community care settings. Future QI projects of value would include examining the effect of educational sharp safety initiatives in the COVID-19 vaccine clinic setting and looking at the impact of mindfulness training on reducing rates of needlestick injury during the pandemic.

In the clinical setting, it is critically important that we maintain awareness of sharp safety, continue the dialogue surrounding consequences of needlestick injuries and bloodborne pathogen exposure, and commit to ongoing educational initiatives centered on sharp safety. In academia, sharp safety must be woven into theoretical and clinical nursing courses as an integral concept to help safeguard aspiring new nurses from the dangers of needlestick injuries and subsequent bloodborne pathogen exposure.

References

Black, L. (2013). Chinks in the armor: Percutaneous injuries from hollow bore safety-engineered sharps devices. American Journal of Infection Control, 41(5), 427–432. https://doi-org.proxy-hs.researchport.umd.edu/10.1016/j.ajic.2012.05.025

Centers for Disease Control and Prevention. (2015). Sharps Safety for Healthcare Settings. Retrieved from CDC website, https://www.cdc.gov/sharpssafety/index.html

Centers for Disease Control and Prevention. (2008). Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program.

Chambers, A., Mustard, C. A., Holness, D. L., Nichol, K., & Breslin, F. C. (2015). Barriers to the Adoption of Safety-Engineered Needles Following a Regulatory Standard: Lessons Learned from Three Acute Care Hospitals. *Healthcare policy = Politiques de sante*, *11*(1), 90–101. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4748368/

International Safety Center. (2018). EPINet Report for Needlestick and Sharp Object Injuries. Retrieved from ISC website, https://internationalsafetycenter.org/wpcontent/uploads/2019/07/Official-2018-US-NeedleSummary-FINAL.pdf

Kargrin, C., and Aykol, A.D. (2016). Needlestick and Sharps Injuries among Nurses. Global Journal of Nursing & Forensic Studies, 1: 209. doi: 10.4172/2572-0899.10000109

Occupational Safety and Health Administration. (n.d.) Frequently Asked Questions. US Department of Labor Occupational Safety and Health Administration website, https://www.osha.gov/needlesticks/needlefaq.html

Rajkumari, N., Mathur, P., Gunjiyal, J., & Misra, M. C. (2015). Effectiveness of Intensive Interactive Classes and Hands on Practice to Increase Awareness about Sharps Injuries and Splashes among Health Care Workers. *Journal of clinical and diagnostic research: JCDR*, *9*(7), DC17–DC21. https://doi.org/10.7860/JCDR/2015/12833.6219

Yang, L., & Mullan, B. (2011). Reducing needlestick injuries in healthcare occupations: an integrative review of the literature. *ISRN nursing*, *2011*, 315432. https://doi.org/10.5402/2011/315432

Appendix A. Evidence Review and Synthesis Tables

Table A1. Evidence Review Table

Citation: Chambers, A., Mustard, C. A., Holness, D. L., Nichol, K., & Breslin, F. C. (2015). Barriers to the Adoption of Safety-Engineered Needles Following a Regulatory Standard: Lessons Learned from Three Acute Care Hospitals. *Healthcare policy = Politiques de sante*, *11*(1), 90–101. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4748368/					Level VI
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
To describe ongoing barriers to the prevention of needlestick injuries among healthcare workers.	Qualitative case study	**Sampling Technique**: Geographic sampling was used to identify 17 community and teaching hospitals that were within 40 km of the research offices; from this roster, hospitals were randomly sampled to participate. Staff at each hospital were purposefully recruited to obtain a broad range of perspectives to include those involved in the implementation of safety engineered needles and those from departments where SENs were frequently used. **Power analysis**: N/A **Group Homogeneity**: The three participating hospitals each provided acute care	**Data collection**: Document records and face-to-face interviews. Informants from the occupational health and safety department helped with the collection of supporting documents including: evaluation reports, written policies and procedures, incident reports, inspection orders, safety product lists, training materials and administrative documents from the sharps safety committees.	**Measurement:** The complete data set included 30 semi-structured interviews, 55 document summary forms, 36 case summary forms and 32 field notes. **Time**: Data was collected over a 24-month period. **Generalizability:** Despite variation in processes and outcomes, there were consistent themes across the three hospitals specific to implementation challenges, ongoing needlestick injuries, and organizational constraints.	**Statistical Procedures**: Thematic analysis, narrative analyses were completed to identify patterns and themes within and across the three case sites. **Results**: Two primary themes emerged from the case studies: 1) the influence of technology, practice and the work environment on ongoing needlestick injury risk and 2) organizational constraints to further invest in needlestick injury prevention. Product limitations and environmental conditions reported help explain ongoing reports of needlestick injuries (i.e. unpredictable patient interactions, downstream risks of

		services in cities serving primarily large urban populations. Different types of safety engineered needles were available across the three hospitals including manual (active) and semi-automatic (semi-passive).			exposure, and safety device activation and design). The study suggests that there is a need for organizations who have already integrated SENs to continue to consider needlestick injury prevention a priority and promote continued adherence to safer needle use. Hospitals can take advantage of opportunities to increase awareness and opportunities to discuss recent injuries that have been reported during staff meetings to identify opportunities for prevention.
Citation: Black, L. (2013). Chinks in the armor: Percutaneous injuries from hollow bore safety-engineered sharps devices. *American Journal of Infection Control*, *41*(5), 427–432. https://doi-org.proxy-hs.researchport.umd.edu/10.1016/j.ajic.2012.05.025					Level V
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
To determine injury patterns from safety-engineered devices occurring subsequent to implementation of the NSPA and to	Retrospective review	**Sampling technique**: Analysis of data from all hospitals who voluntarily reported data to the Exposure Prevention	**Analysis protocol**: Injuries to nurses, physicians, and phlebotomists/venipuncture team members were specifically examined.	**Measure:** Percutaneous injuries from safety-engineered sharps	**Statistical analyses**: Pearson *t* statistics, analysis of variance, and cross tabulation including χ^2 analysis was used to compare

identify and examine usage patterns that may create hazards in individual categories of HCWs.		Information Network (EPINet) surveillance system. **Eligible data**: Injury data from 3,297 PIs involving hollow bore SESDs that occurred in 62 hospitals between 2001 and 2009 (after NSPA implementation). **Excluded:** 215 injuries omitted from analysis because they were associated with solid, not hollow-bore needles. Data from injuries that occurred prior to device use (as opposed to after device use) were excluded from the sample. **Group Homogeneity:** The study sample represents hospitals that voluntarily reported exposure data to the Exposure Prevention Information Network (EPINet) surveillance system are geographically diverse, and include university,	Data from other HCW categories (respiratory therapist, technologist, nursing assistant, clinical laboratory worker, surgery attendant, housekeeper, paramedic, laundry worker, security personnel, dentist) were aggregated into a separate category and analyzed together.	devices by job type 2001-2009	key study groups. Bonferroni correction was used to control for multiple comparisons when indicated. All analyses were conducted on aggregated data using STATA 11.0. **Results:** The proportion of injuries attributed to SESDs increased from 32.4% (n/N = 358/1,105) in 2001 to 65% (n/N = 318/489) in 2009 (t = 28.4; P < .01) 64.6% (n/N = 2,131/3,297) of injuries documented in EPINet were sustained by nurses, exceeding that of all other HCW categories combined (χ^2 = 8.75; P < .01). Nurses were also reportedly more frequently injured by devices in each device categories (F = 6.2; P < .05). Phlebotomists accounted for 12.1% (n/N = 398/3,297) of all hollow bore needle injuries

		teaching, and community hospitals.			Physicians sustained 3.9% (n/N = 127/3,297) of the reported injuries. 95.5 percent (n/N = 380/398) of injuries to phlebotomists took place while the HCW was drawing a venous sample.
Citation: Yang, L., & Mullan, B. (2011). Reducing needlestick injuries in healthcare occupations: an integrative review of the literature. *ISRN nursing*, *2011*, 315432. https://doi.org/10.5402/2011/315432					Level I
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
The purpose of this systematic review is to conduct a rigorous and integrative review of interventions designed to decrease healthcare occupational injuries.	Systematic review	**Search strategy**: Searches were conducted using five databases: MEDLINE, PsycINFO, SCOPUS, CINAHL, and Sciencedirect. The terms "glove perforation," "Needle-stick injuries," "reducing percutaneous injuries," "gloving tears," "reducing sharp injuries," and "occupational exposure in healthcare" were used in the initial search in all databases. **Eligible studies**: Only studies evaluating a needle-stick injury intervention, and	**Control**: Varied among studies. Some studies used unused gloves as controls to test for preexisting minor perforations. **Intervention:** Primarily focused on use of double gloves in preventing needle-stick injuries, others included educational intervention, use of blunt needle. **Protocol**: N/A	**Dependent variable:** Varied among studies **Measure**: Rate of glove perforation, detection rate of glove perforation, evaluation of devices used, changes in knowledge, self-reported universal precautions behavior, and observed adherence to universal precautions were analyzed.	**Level of measurement**: Meta-analysis **Outcome data retrieval:** Researchers pooled data from all selected articles. **Analysis:** The quasi-experimental study looked at the impact of structured training on the incidence of needle-stick injuries among student nurses reporting a significantly higher score on both knowledge ($P < .001$) and behavior ($P = .002$) in the group who received the blood borne pathogens training. In comparing blunt and sharp needles in one study, a significantly

		deliberately designed to contain both a study and a control group within the past 10 years were included. Both studies using new safeguards and providing educational training were reviewed. **Excluded**: Studies were rejected if they were not published in a peer-reviewed journal, if the text was not in English, or if it did not meet the inclusion criteria determined from the title and abstract during screening. **Included**: 14 studies met the inclusion criteria. 10, 10 were randomized control trials of interventions, 2 studies used a cohort design with no randomization of participants into conditions, 1 study had a prospective randomized design. The remaining study used a quasi-experimental design using a randomization			higher number of surgical procedures were noted to involve perforations using the sharp needle (*P* = .003) than with the blunt tapered needle and detection rate was low (21%). Data from studies on double gloving varied. **Conclusions:** More studies are needed to evaluate interventions in nonsurgical settings and among other healthcare personnel. The evidence suggests that both safeguard interventions and educational training programs effectively reduce the risk of having needle-stick injuries. **Bias risk:** Differing methods in comparing intervention and control groups may bias interpretation of the results. Selection issues were also a potential source of bias for some studies.

		procedure for groups instead of for each participant. **PRISMA**: Guidelines on undertaking reviews were followed, with reference to the evaluative checklist for reviewing outcome measures. **Power Analysis**: N/A			
Citation: Rajkumari, N., Mathur, P., Gunjiyal, J., & Misra, M. C. (2015). Effectiveness of Intensive Interactive Classes and Hands on Practice to Increase Awareness about Sharps Injuries and Splashes among Health Care Workers. *Journal of clinical and diagnostic research : JCDR*, *9*(7), DC17–DC21. https://doi.org/10.7860/JCDR/2015/12833.6219					Level IV
Purpose/ Hypothesis	Design	Sample	Intervention	Outcomes	Results
To assess the usefulness of classes in HCWs in improving the knowledge of needlestick and sharps injuries and to evaluate the staff awareness of effective and correct practices of NSIs/ sharps injuries and splashes at all stages. The study attempted to evaluate exposure reporting practices.	Prospective interventional cohort study	**Sampling technique**: Convenience sampling (study volunteers working in trauma center). **Eligible participants**: HCWs working in various departments of the Trauma Center who volunteered. **Accepted**: 75 HCW volunteers working in various departments of the Trauma Center. **Excluded**: None	**Intervention protocol:** HCWs were randomly divided into 5 different groups: doctors, nurses, hospital attendants, hospital cleaning staff/ waste disposal staff, and laboratory technicians. Questionnaires were given before and after the classes and their knowledge assessed based on point system. HCWs were also assessed for how they handled exposures in their work areas. This was assessed by non-informed, anonymous visits by one	**Dependent variable**: Increased knowledge of needlestick and sharps injuries and staff awareness of effective practices. **Measure:** Pre and post knowledge assessment. The level of correct answers and observations were divided into 3 cut off levels. **Time**: Four months	**Statistical analyses**: Information not noted within article Voluntary reporting improved up to 32% non-doctor/non-nurse HCWs 50-80% improvement in theoretical knowledge was noted after the first class, with 50-95% improvement noted after the second class. Practical improvement in work practices increased up to 95%

			Infection Control staff or a Microbiology resident. **Intervention fidelity**: The anonymous questionnaire consisting of of 15 questions was evaluated by a team of Microbiologists and Hospital Infection Control Staff and was piloted in different groups of HCWs.		after the second class. Little improvement was noted after the first class. **Conclusion**: Awareness classes and with hands on experience was shown to improve NSIs/sharps exposure management and should be incorporated into routine practice.

Table A2. Synthesis Table

Level of Evidence	# of Studies	Summary of Findings	Overall Quality
Evidence Based Practice Question (PICO): Do education and awareness strategies aimed at promoting proper use of safety engineered devices (SEDs) reduce the rate of needlestick injuries compared to adoption of SEDs alone?			
I	**1**	Yang and Mullan (2011) found that both safeguard interventions and educational training effectively reduce risk of needlestick injuries.	A, only those studies evaluating needle-stick injury interventions designed to contain a study and a control group (within the past 10) years were included. Sample of articles reviewed adequate at 14. Results consistent with earlier reviews. The authors note that more studies are needed to evaluate interventions in nonsurgical settings, to look data among other healthcare personnel, and to examine both safeguard interventions and educational training interventions together in surgical and nonsurgical settings
IV	**1**	Rajkumari, Mathur, Gunjiyal, & Misra (2015) concluded that sharps safety awareness classes and hands on practice with safety engineered devices are useful in spreading awareness and improving the knowledge to address sharps injuries/needlesticks/splashes. The authors recommend pairing routine education with compulsory hepatitis B virus vaccination.	C, sample size was limited at 75 HCWs. Power analysis not performed.
V	**1**	Black (2013) identified that in addition to careful selection and implementation of appropriate safety engineered device designs, ongoing education of users regarding accurate activation techniques are critical to an effective sharps injury prevention program. In addition, the author noted that education should include didactic instruction and hands-on practice with these devices at device implementation and on a recurring basis, especially for those devices that are used less often. Black (2013) notes that passive devices represent a small portion of safety engineered devices in use, and that greater adoption of these devices and continual education of end users is also essential to effective sharps injury prevention programs.	B, review of retrospective data had a large/adequate sample size. Data collected from 62 hospitals with data reflected from different types of HCWs (doctors, nurses, phlebotomists).
VI	**1**	Chambers, Mustard, Holness, Nichol, & Breslin found that hospitals can implement small changes to continue to enhance prevention like taking advantage of opportunities to increase awareness and identifying opportunities for prevention. The authors also discussed	B, qualitative case study design implemented in three acute care hospitals. Thematic analysis performed to identify patterns and included retrospective reflections and reflections on current and future conditions

		how regulatory standards alone have not effectively decreased sharps injuries, and renewed commitment of hospitals is needed to achieve further progress.	

Appendix B. Sharp Safety Data Collection Tool

Sharps Injuries FY21 Quarter 2

October

Date	Dept.	Designation	Discipline	Device	Phase	Note	Hire Date	Hour of injury	New Grad
1-Oct	Cath Lab	I	X-Ray Tech	Scalpel	After use	Improper cutting off drape after procedure	8/1/2018	4th	N/A
6-Oct	Orthoped.5		Physician Assista	Suture	During use	Stuck during procedure	1/31/2015	7th	N/A
12-Oct	HVU	I	RN	Insulin Pen	During use	Pinched skin slipped from grip	8/15/2020	5th	N/A
17-Oct	ED	I	MD	Injection Needle	During use	Stuck while injecting lidocaine	?	unknown	N/A
21-Oct	MFM	O	RN	Injection Needle	During use	Recapping	2/19/2018	8th	N/A
21-Oct	ACE	I	RN	Insulin Pen	During use	Patient Movement	5/21/2018	unknown	N/A
22-Oct	LAB	I	Phlebotomist	Butterfly	After use	Improper handling of device	9/9/2019	1st	N/A
28-Oct	NICU	I	RN/Clin Super.	IV Catheter	After use	Improper handling of device	12/18/2006	2nd	N/A

November

Date	Dept.	Designation	Discipline	Device	Phase	Note	Hire Date	Hour of injury	New Grad
11/14/2020	GSU	I	PCT	Butterfly	Non User Injury	RN left needle exposed, tech was cleaning up	8/6/2012	unknown	N/A
11/25/2020	LAB	I	Phlebotomist	Needle	During use	Combative Patient Pulled hand away	9/14/2020	2nd	N/A
11/29/2020	ICU	I	RN	IV Catheter	During use	RN had phone in pocket, phone rang during inserting, startled	10/12/2020	3rd	N/A

December

Date	Dept.	Designation	Discipline	Device	Phase	Note	Hire Date	Hour of injury	New Grad
12/8/2020	HCE	O	Phlebotomist	Needle	Unknown	noticed superficial cut on right pinky finger after removed gloves	10/12/2020	2nd	N/A
12/11/2020	ED	I	MD	Injection Needle	after use	Patient distressed, jerking movements, stuck finger after giving block	unknown	2nd	N/A
12/20/2020	ONC	I	RN	Needle	after use	needle grazed finger after injecting lovenox	12/4/2017	unknown	N/A
12/24/2020	HCE	O	RN	Needle	Non User Injury	Nurse was removing red bioharzard bag and needle stuck finger	5/29/2012	3rd	N/A
12/27/2020	GSU	I	RN	Injection Needle	after use	Impoperly engaging saftey with non dominate hand	3/18/2019	10th	N/A
12/29/2020	LAB	O	Phlebotomist	Needle	after use	was showing the patient the rubber covered needle and stuck herself	11/30/2020	unknown	N/A

	Total	Pt Days	Rate per 1,000
Inpatient:			
	12		
	Total	Cases	
Surgical:			
	1		
	Total	RVU	
Outpatient:			
	4		

RN	7
Med Staff (PA)	3
X-ray Tech	1
PCT	1
Phleb.	4

Hired in the last 18 months:

Device	Total
Syringe	
IV Cath	
Butterfly	
Suture	
Scalpel	
insulin pen	
Admix. NDL	

Protected and Confidential as per Maryland Code Section1-401 (d)(3)(ii) of the Health Occupations Article of the Ann. Code Md.

Appendix C. Pre/Post Implementation Survey

Please select the most appropriate response to reflect how much you agree or disagree with the following statements:

1. **Preventable needlestick injuries still occur in 2020.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

2. **Preventable needlestick injuries are a concern at AAMC.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

3. **I know the process to follow if I incur a needlestick injury.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

4. **I know what a safety engineered device is.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

5. **I know how to use the safety engineered devices used for injections at AAMC.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

6. **Training on how to use the safety engineered devices used for injections at AAMC was included in my new employee orientation.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

7. **I know who to contact if I need training on using the safety engineered devices available to use for injections.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

A preventable needlestick injury is one that can be prevented by following procedures that have been shown to decrease or eliminate risk (i.e. not recapping needles). Considering this, please answer questions 8 and 9.

8. **Many preventable needlestick injuries occur because the safety mechanism was not engaged on a safety engineered device.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

9. **Many preventable needlestick injuries occur because the safety mechanism was not engaged <u>immediately</u> after performing an injection.**

   (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

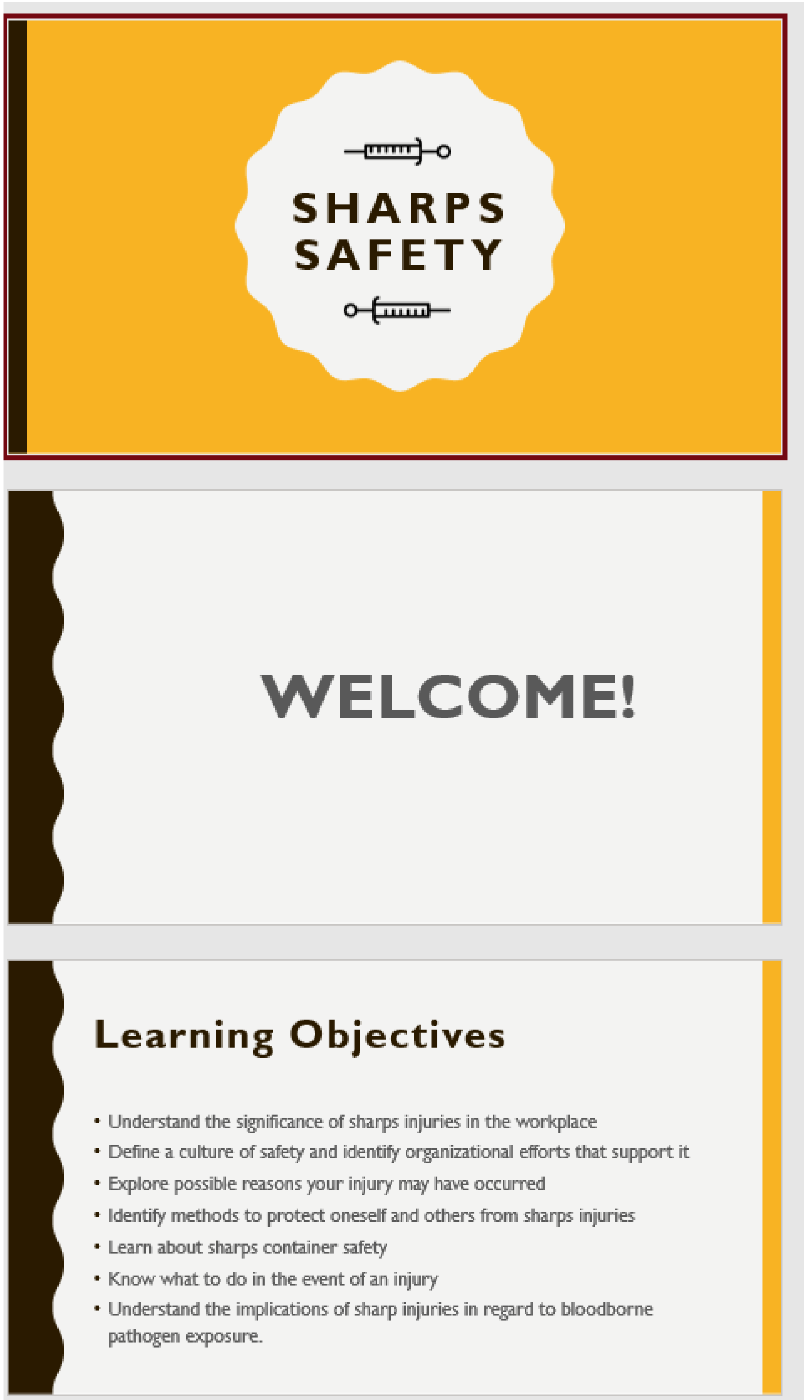
10. **I know AAMC's preferred method(s) for engaging the safety mechanism after giving an injection.**

    (1) Strongly disagree; (2) Disagree; (3) Neither agree nor disagree; (4) Agree; (**5**) Strongly agree

Figure C1. QR Code to Access Pre-Implementation Survey Result Data

Figure C2. QR Code to Access Post-Implementation Survey Result Data

Appendix D. Sharp Safety NEO Presentation Slides/Post-Injury Module Slides



Please view full presentation using this QR code

Appendix E. Sharp Safety Awareness Methods

Figure E1. Visual Cue

Figure E2. Safety Campaign Branded Ink-Pens

Figure E3. Snippet from Organizational Newsletter Publication

Sharps Safety Program

The Sharps Safety Program is launching a fall campaign to promote thumb-only activation for safety syringes. Remember, whenever you have a syringe in your hand, think: "Thumbs UP for safety!"

Activate the safety mechanisms with the thumb of your dominant hand immediately after giving an injection, and Stay Sharps Safe!

Appendix F. Structure, Process, and Outcome Measures

Figure F1. Structure Measure: Number of Safety Huddles Conducted

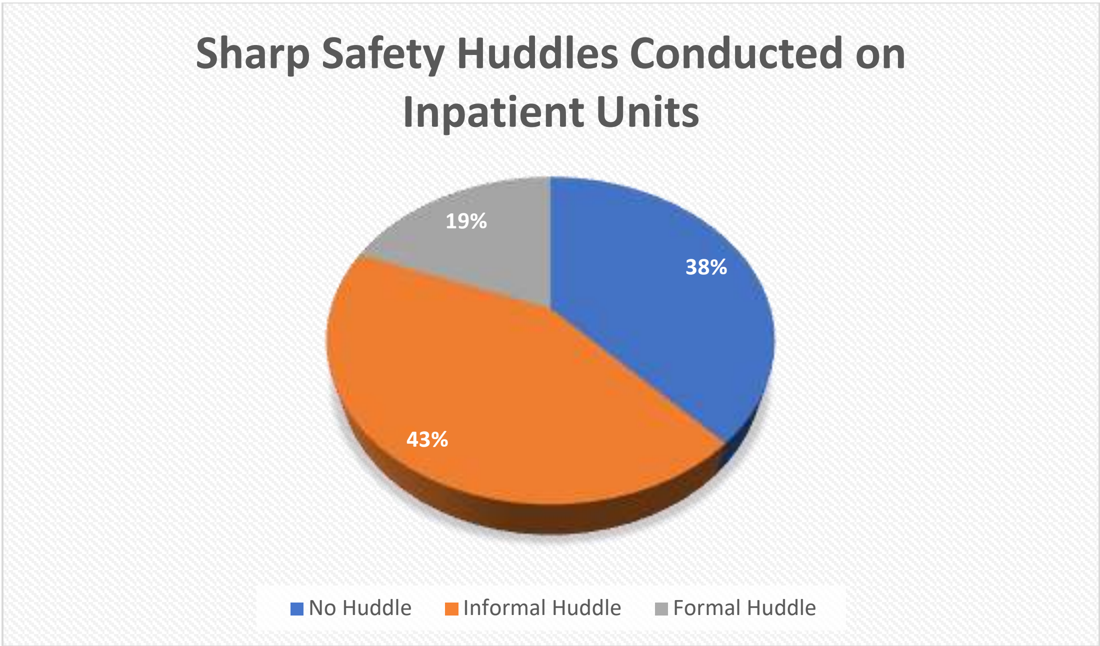


Figure F2. Structure Measure: Visual Cue Presence

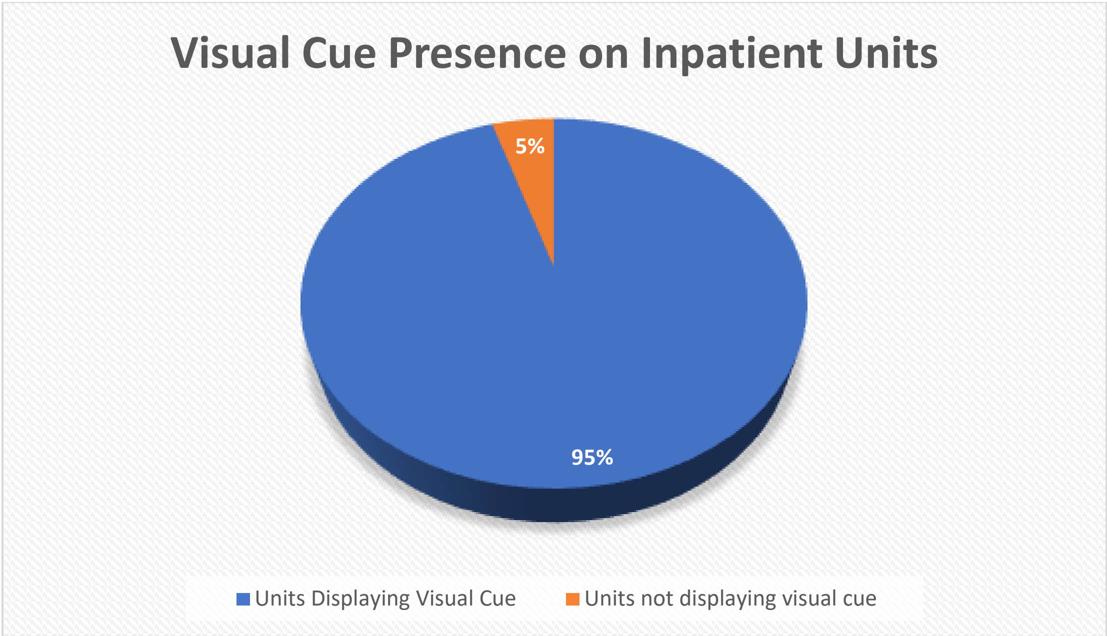


Figure F3. Process Measure: Post-Injury Module Completion

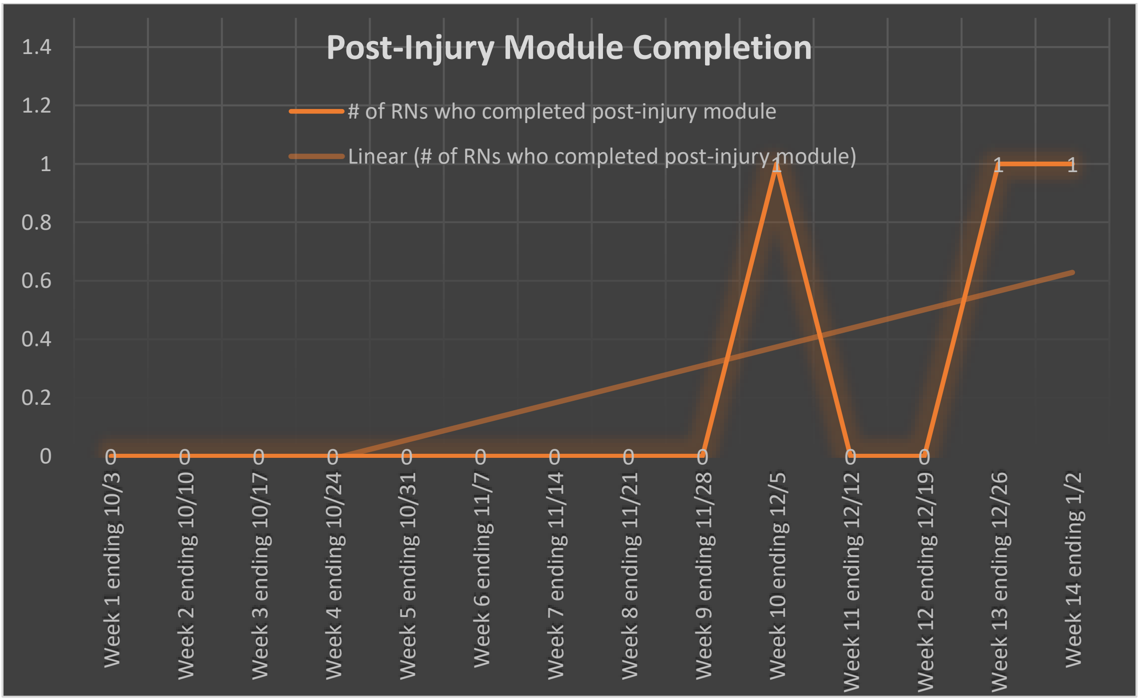


Figure F4. Outcome Measure: Rate of Needlestick Injuries (Monthly)

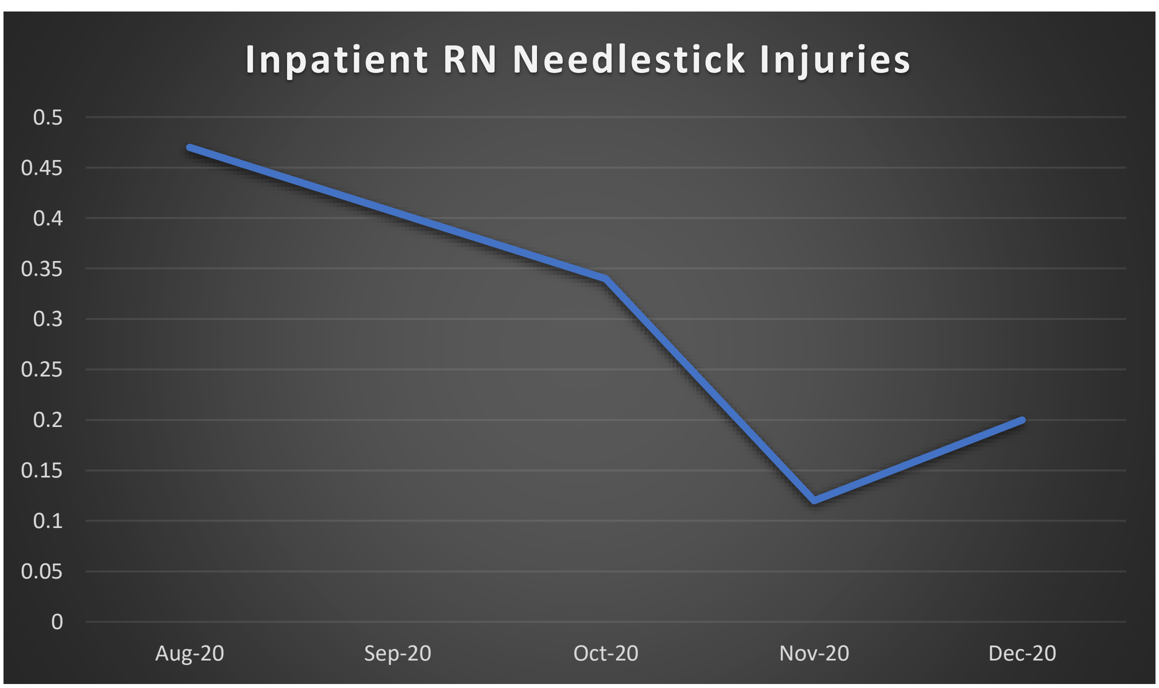
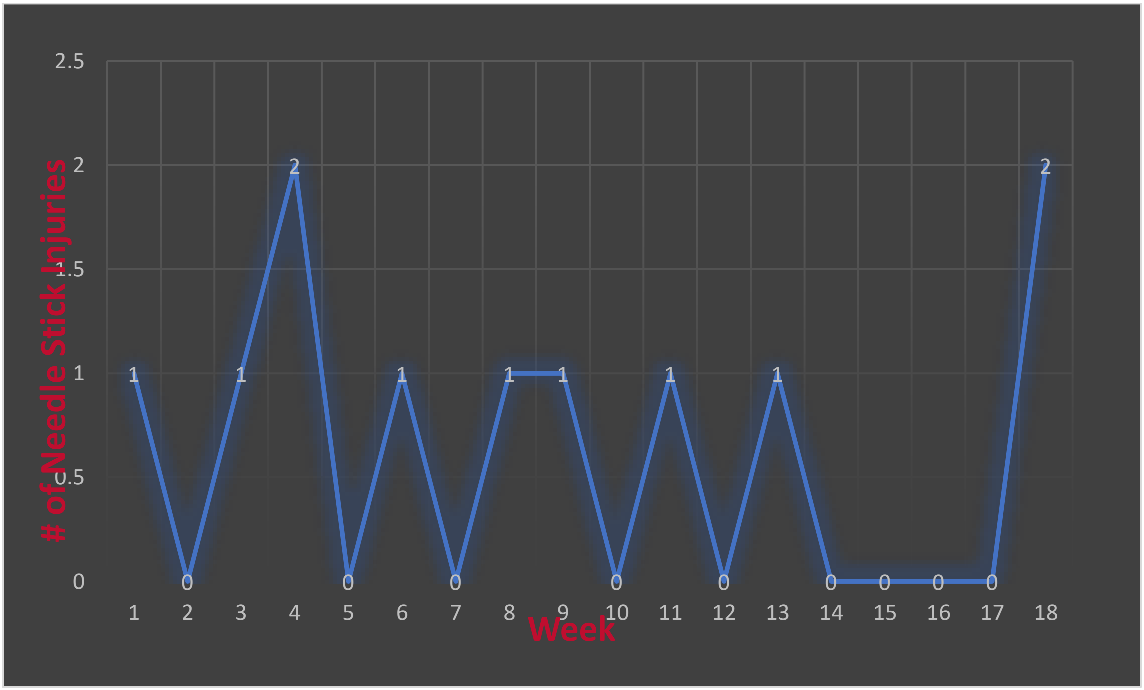
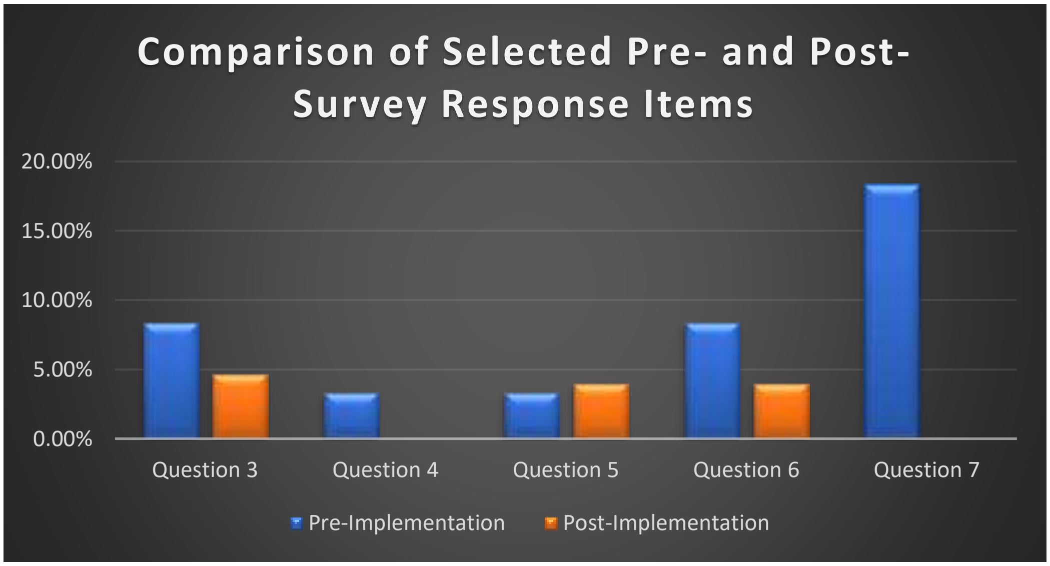


Figure F5. Outcome Measure: Rate of Needlestick Injuries (Weekly)



Appendix G. Survey Response Data

Figure G1. Comparison of Selected Pre-and Post-Survey Response Items



The graph above reflects the percentage of respondents (out of 100%) who answered “Disagree” or “Strongly Disagree” to the survey items. (Note: percentage of those who answered disagree or strongly disagree combined for brevity).

- Question 3: I know the process to follow if I incur a needle stick injury.
- Question 4: I know what a safety engineered device (SED) is.
- Question 5: I know how to use the SEDs used for injections at [the project site].
- Question 6: Training on how to use the SEDs used for injections at [the project site] was included in my new employee orientation.
- Question 7: I know who to contact if I need training on using the SEDs available to use for injections.

NOTES: Available survey responses were strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree. There was great disparity in the number of pre-survey respondents compared to post-survey respondents. Pre-survey respondents: n=120; post-survey respondents: n= 25. The reason for this is unknown, but suspected to be due to a change in the Clinical Site Rep (CSR) and the associated decrease in presence on the units during her orientation period; and a change in the available format of the surveys which may have caused confusion (pre-surveys offered on paper only; post-surveys offered on paper and in an electronic option accessible by QR code posted on units as suggested by the CSR).

Figure G2. Selected Pre-Implementation Survey Responses