The Epidemiology of Sharp Injuries in Healthcare Workers at a Trinidadian Community Hospital

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OBJECTIVE

To describe the epidemiology of sharp injuries, in healthcare workers, at the Sangre Grande Hospital (SGH) in Trinidad. A secondary analysis of non-sharp injuries was also done. Sharp injuries predispose staff to blood borne infections and thus are occupational infection prevention and control matters. Sharp injuries were observed to be a problem at the SGH. This study served to gather data for informed decision making.

METHODOLOGY

A retrospective descriptive study was done by reviewing all IPC reporting forms from reported healthcare worker injuries at the Infection Prevention and Control (IPC) Department for the period 2007-2017. All persons recorded as having being injured by sharps and secondarily, non-sharp occupational exposures, at the IPC department were included. We looked at employee case management including testing for blood borne Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and C virus (HCV), management and treatment. Simple descriptive statistics were used to present the findings.

RESULTS

All 148 notes were reviewed after which entries having greater than 10 missing data points or fields were excluded from the study analysis, leaving 138 notes. Age ranges were between 20 – 62 years with the mean age of the affected population being 33 years. A total of 104 (75.4%) females were injured compared to 32 (23.2%) males. Persons injured were mainly from the wards (n=81, 58.5%): internal medicine (n=46, 33.3%) and general surgery (n=22, 15.9%). Accident & Emergency (A&E) accounted for 10.1% (n=14) of the cases. Registered nurses (n=37, 26.8%), physicians (n=22, 15.9%) and students (n=20, 14.5%) were the main categories of staff affected. The highest number of events occurred between 10:00-11:00 in the morning [am] (n=29, 20.6%). The majority of these incidents (n=123, 89.1%) were first reported to SGH A&E. Most injuries occurred while disposing of needles (n=17, 12.3%). It was noted that 73 (52.9%) of the documented cases occurred on fingers. HIV, HAV & HBV tests were done in 136 (98.6%) of the 138 staff members recorded. In 120 (87%) events the source patient was tested. A total of 114 (84.4%) persons had been vaccinated for

HBV; 77 (58.8%) persons had post exposure prophylaxis (HIV) for one month. One (1.3%) person reported seroconversion after six months to positive HIV status.

CONCLUSION

Sharp injuries in employees were common in internal medicine and general surgery wards. These injuries were common in the late morning, on the fingers. Only one exposed employee seroconverted over the entire period.

Key Words: Sharp Injuries, Epidemiology, Seroconversion, Staff

INTRODUCTION

The World Health Report of 2002 noted that 2 million healthcare workers experience percutaneous exposure to blood-borne pathogens, yearly. Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) account for 37.6%, 39% and 4.4% of exposures, respectively, in healthcare workers around the world, due to percutaneous injuries.[1] It has been noted that the rate of HIV, HBV, and HCV infections among healthcare workers, which are caused by sharps injuries, is high in the Caribbean and Latin America.[2] Sharp injuries have been noted to be higher in this region than in other regions of the world.[2] This is a serious occupational and infection prevention and control health risk to physicians, nurses and other health professionals due to the risk of contracting the blood borne pathogens HIV, HBV and HCV.[1,2]

In the United States of America [USA] a data collection system called EPINet, estimates that between 600,000 and 800,000 sharp injuries occur annually among healthcare worker.[3] To curtail the incidence of sharp injuries, the USA Senate introduced protective legislation. Interventions to protect staff include, having access to needle-free and safer sharps systems and a requirement for all sharps injuries to be recorded.[3] The Royal College of Nursing (RCN), in the United Kingdom found that improper disposal of sharps and needles accounted for a significant number of injuries.[4] In 2001, the RCN launched the "Be Sharp Be Safe" campaign to reduce sharp injuries and included a surveillance arm to describe the patterns of sharps injuries.[4] In the Caribbean region, needle stick prevention training programs began in 2011 with a train the trainer workshop and a small study to follow up training.[5]

Chadee *et al* has noted in a publication in 1999 that 397 "inoculation" injuries occurred from 1991 to 1997 across various hospitals in Trinidad and Tobago. Needle sticks, bites, injuries with sharps other than needles and splashes were all considered by Chadee *et al*.[6] Needle sticks accounted for most inoculations while splashes accounted for a small number of inoculations. Thus, new data is needed to inform decision making in the efforts to combat blood borne infections caused by accidental occupational injury, to provide quality healthcare in at the Sangre Grande Hospital (SGH).[3-6]

In Trinidad and Tobago, guidance on reporting of sharp injuries, resulting in blood borne pathogen exposure, is

provided in the National Infection Prevention and Control Policies and Guidelines Manual of 2011.[7] The reporting of incidents and a descriptive study of the Infection Prevention and Control (IPC) Department reports, for blood borne pathogen exposure, is examined here. This study focused primarily on healthcare staff.

METHODS

IPC reporting forms entitled: Occupational Exposure to Blood Borne Pathogens Report Form, at the IPC Department at the Sangre Grande Hospital (SGH) in Trinidad, West Indies provided the data for this study. This form is available in the National Infection Prevention and Control Policies and Guidelines Manual of 2011 as Appendix 5. All notes were examined for the period 2007 to 2017. These IPC reporting forms are kept for staff members that sustain sharp injuries or other blood borne pathogen exposure, e.g. bodily fluid exposure by splash on mucous membranes. This study's primary focus was sharp injuries in healthcare workers. Only IPC reporting forms were reviewed as outlined. This study was a review of all reporting forms for the period and thus all completed forms in the department for the study period were examined and data extracted with a data extraction instrument. This represented all reported sharp injuries, and secondarily, other occupational bodily fluid exposures, occurring at this facility during the period such as "splash" due to bodily fluid exposure. All persons recorded as having sharp or any other type of occupational exposure such as bodily fluid, at the IPC department were thus included in the study.

The data from each case was recorded in a predesigned data collection instrument which included: age, gender, category of staff, department, procedure, action failure and location of the injury, in addition to other parameters. The data was segmented into (1) demographics, (2) injury rate, ward and staff, (3) mechanism of injury, (4) time and place of reporting, (5) laboratory testing. Rapid HIV tests were done as per HIV/AIDS Coordinating Unit (HACU) guidance and rapid hepatitis tests were used for screening. Confirmation was by Trinidad Public Health Laboratory (TPHL) if patients tested positive. (6) Vaccination for HBV and post exposure prophylaxis (PEP) for HIV/AIDS. An "other" category of staff comprised non-medical staff such as wards maids [responsible for cleaning] and daily paid [who also take part in sanitation]. Data was recorded for blood-borne viruses including HIV, HBV and HCV. The source patient, defined as a patient who had a procedure performed and then a staff member was injured or exposed from an instrument injury or bodily fluid "splash" from that patient's procedure. This source patient had data extrapolated only for testing for blood borne pathogens. The field denoted "action failure" refers to any pre-determined set of actions which were supposed to be followed, for example, in a checklist as part of a care bundle for surgical procedures, which were not followed correctly such as suturing or a surgical procedure, involving blood borne pathogen exposure. Importantly, we also secondarily looked at non-sharp bodily fluid occupational exposures such as "splash", which would have caused bodily fluid exposures to blood borne pathogens and as mentioned before.

Data Analysis

Data was analysed with IBM SPSS® v 22 (SPSS) and primarily looked at descriptive statistics. A Microsoft Excel® spreadsheet was also used to transcribe the data from the data extraction sheets after which it was transferred to SPSS.

Missing Data Analysis

This was done to examine the quality of data collected at the IPC department as it was observed that certain variables had missing data prior to the start of the study. Due to the quantity, these responses were classified as missing and, as such, a missing data analysis was conducted to determine the impact, if any, that these unanswered fields may have on the analysis. Missing data was coded as 999 and analysed with SPSS using the relevant code for missing data. A simple frequency analysis was performed on the quantity of missing data for each row of data collected and entered. Entries with large missing data were excluded from the general data analysis. Further to this, a missing data frequency analysis was performed on key selected variables, which calculated the quantity of missing data related to each of these critical variables. The criteria for excluding an IPC reporting form, from the overall analysis, were entries having greater than 10 missing data points or fields.

Rate of Staff Injuries

Staff injuries were expressed as a ratio per thousand staff population per year: number of injuries divided by staff population, for a given year, at the hospital then multiplied by 1000.

RESULTS

Demographics

A total of 148 notes were reviewed for the 11-year period of the study. Ten (10) notes were excluded after missing data analysis was done, leaving 138 notes for analysis. Ages of affected staff members ranged from 20 – 62 years. Ages 26-29 were most affected with 104 (75.4%) females injured compared to 32 (23.2%) males affected. The average age of this population was 33 years with the median age being 29 year (see Table 1).

Table 1: Demographic Breakdown of the Staff

Demographics		Number	Percent*
Gender	Male	32	23.5%
	Female	109	76.5%
Age Range	20-25 years	25	20.5%
	26-30 years	43	35.2%
	31-35 years	14	11.5%
	36-40 years	12	9.8%
	41-45 years	11	9.0%
	46-50 years	7	5.7%
	51 years and over	10	8.2%
Specialty	Accident & Emergency	14	10.1%
	Internal Medicine	46	33.3%
	Obstetrics & Gynaecology	10	7.2%
	General Surgery	22	15.9%
	Paediatrics	1	0.7%
	Oncology	2	1.4%
	OT	4	2.8%
	Other	33	25.0%

Injury rate, ward and staff

The sharp injury and secondary non-sharp injury rate were approximately 13.5 per thousand staff population per year (see Figure 1). Persons injured were mainly from the wards [n=81, 58.5%]: Internal Medicine [n=46, 33.3%] and General Surgery [n=22, 15.9%). See figure 2 for distribution of sharp and secondary non -sharp injuries by specialty area. Accident and Emergency (A&E) accounted for 14 [10.1%] cases. Registered nurses [n=37, 26.8%], physicians [n=22, 15.9%] and students [n=20, 14.5%] were the main categories of staff affected however the "other" category, contributed to approximately 96 [30%] injuries.

Figure 1: Trend in Rates of Sharps and Non-Sharp injuries 2007- 2017

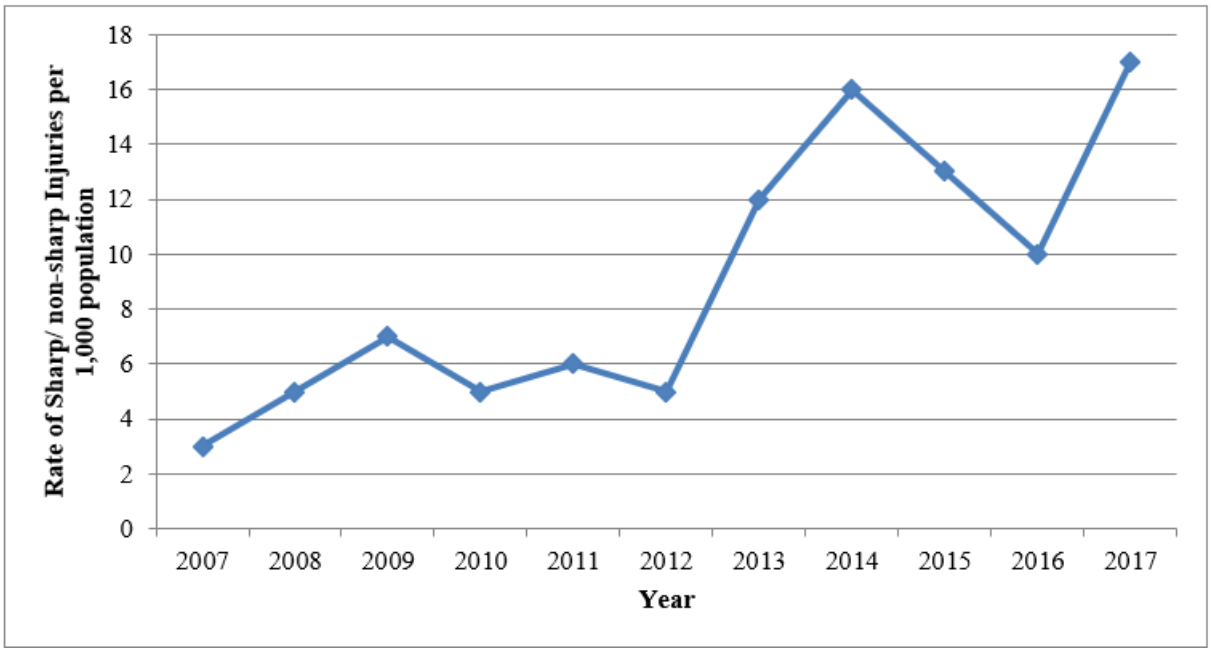
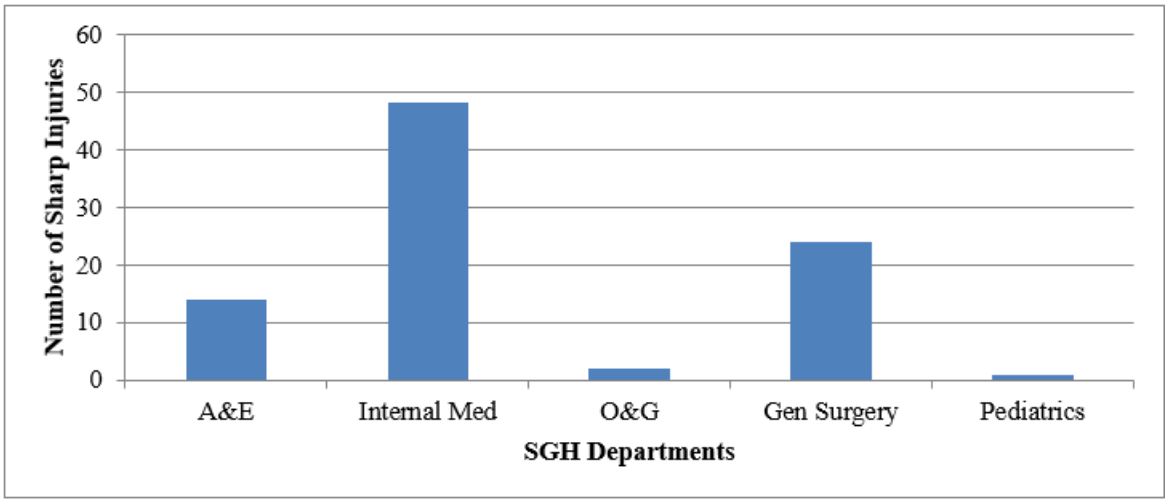


Figure 2: Distribution of Sharps and Non-Sharp Injury by Specialty

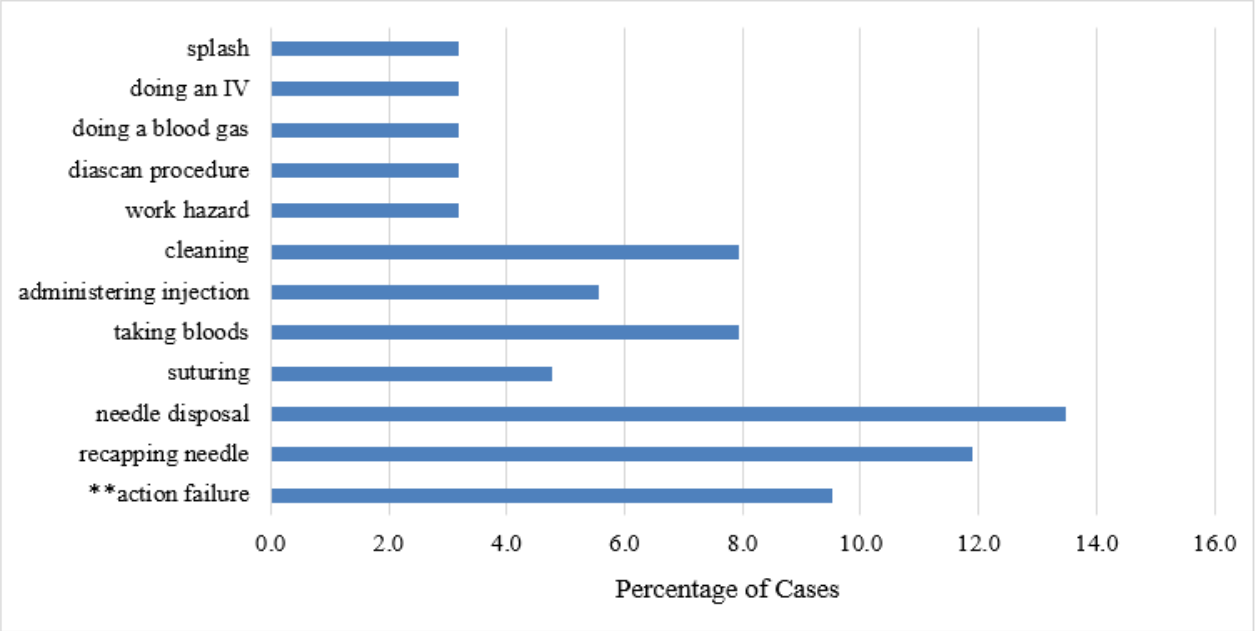


Internal Med – Internal Medicine, A & E – Accident and Emergency, O & G – Obstetrics and Gynaecology, Gen Surgery – General Surgery, SGH – Sangre Grande Hospital

Mechanism of injury

Most injuries occurred while disposing of needles [n=17, 12.3%], recapping of needles [n=14, 10.1%] and action failure [n=12, 8.7%] also accounting for injuries. In 89 [64.5%] cases, the type of device causing the injury was undocumented or unknown while 73 [52.9%] cases occurred on the fingers. Splash injury was the other closest reported bodily fluid exposure (see Figure 3).

Figure 3: Circumstance under which Injury* Occurred



*Injury refers to sharp or secondarily, non-sharp incidents involving possible exposure to blood borne pathogens or other healthcare transmitted pathogens. **Action failure refers to any pre-determined set of actions which were supposed to be followed, for example in a checklist as part of a care bundle, which were not followed correctly

Time and place of reporting

The highest number of events occurred between 10:00-11:00 in the morning (am) [n=29, 20.6%]. A total of 123 [89.1%] of these incidents were first reported to the SGH A&E with 136 [98.6%] being reported to the IPC department.

Laboratory testing

HIV, HAV & HBV were tested in 136 [98.6 %] staff members out of the 138 that qualified for this study. In 120 [87%] of these events, the source patient was tested by the same methods above for HIV, HAV & HBV, as for staff. One [1.3%] person reported seroconversion after six months. This was an employee who became HIV positive.

Vaccination and post exposure prophylaxis

114 [84.4%] persons had been vaccinated for HBV. A total of 77 [58.8%] persons had post exposure prophylaxis (HIV) for one month.

Missing data

Individual data fields, type of sharp injury device, circumstance under which the event occurred and site of injury all had more than 25% missing data.

DISCUSSION

In studies by Alay et al and Mandić et al, it was found that females had a greater prevalence of occupational exposures to blood, bodily fluids and sharps, similar to this study. Both studies looked at sharp injuries but Alay *et al* also looked at blood and body fluid exposure, similar to the secondary objective in our study.[8,9] The younger age group seen in this study could be due to lack of experience. The higher predominance of females, in this study could also have been due to the fact that females represent a larger part of the workforce, particularly in wards maids and nurses. A larger number of females also reported injuries compared to males as shown in the demographic data.

Injury rate per thousand employees rose from 6.5 per 1,000 staff members affected in 2007 to 18.1 per 1,000 staff members affected in 2017. This could have been due to training gaps, the need to properly orient or "on board" employees and inexperience of new staff.[5,8,9,11] Studies have noted that sharp injuries are high in nursing personnel, as found in this study.[8,9] In fact, Chadee et al in 1999 noted that most injuries occurred in nurses in Trinidad and Tobago.[6]

In this study, physicians and students accounted for a large number of needle stick injuries coming from a wide range of clinical areas; this is similar to other studies.[6,8,9,11] Chadee et al found that wards maids, a type of cleaning staff, had a high rate of inoculation injuries, similar to the high rate of injuries seen in the "other" category of staff, who are cleaning and sanitation staff, in this study and others.[6,8] Mandić et al notably included an "other" category of staff which also included cleaning staff, similar to this study; the authors noted that this category of staff was most predisposed to stabs.[10]

This study found that a majority of injuries occurred during recapping, drawing blood and action failure. Action failure is defined in the methodology and it includes, but is not limited to, failure to follow the steps in a procedure such as suturing, surgical procedures (or any procedure) and administering medication. This is similar to the study by Chadee et al who found that modes of inoculation were needle sticks, injuries with sharps other than needles. Chadee et al found that splash injury accounted for a small number of exposures similar to the secondary objective of this study. In addition, we found that a large number of injuries were reported to the IPC Department, all of whom were directed to A & E, while some went to the A & E first. Thus, there needs to be greater sensitization to the reporting and management of sharp injuries and bodily fluid exposures at the SGH for better management of these injuries so that persons are directed to the most appropriate department first.

There was a large proportion of missing data for the device causing the injury. This precluded proper analysis of the mechanisms of injury. This type of bias is difficult to reduce in a retrospective study and unfortunately occurred. The finger was the main site of injury and thus wearing industrial type gloves, for persons cleaning and other interventions targeting manual handling of sharps will be beneficial. Knowing that most injuries occurred in the late morning allowed tool box talks (informal meetings that are part of an organisation's overall safety program), as an intervention, to educate staff, to occur at the most appropriate time to minimize injuries. These were just 5 to 10 minute talks. It also allowed more vigilance at this time as at this is the time wards are most busy. Mason in 1979, has documented that most occupational injuries occur on a Monday morning. This, however, is not in reference to sharps or bodily fluid exposures but shows morning, as in this study, as being a possible time of occupational injuries.[12] The study by Mandić et al showed that most accidents occurred during the morning shift, similar to this study, giving the increased activity in the morning as the reason.[10]

The required testing was done for the blood borne viruses: HIV, HBV and HCV. The data indicates that the majority of staff were adequately tested, treated and followed up. In addition, one patient with seroconversion after six months indicates the need for continued follow up in managing persons with sharp and non-sharp bodily fluid exposures. Similar to Chadee *et al*, only one person seroconverted over the study period.[6] The person who seroconverted was followed up by the IPC Department for the six months so the mechanism of injury was clear to the department. However, documentation of demographic data was lacking. It also underscores the point that seroconversion is uncommon.
Seroconversion is uncommon as noted by Balouchi et al, Rice et al and Alay et al and there needs to be better data management.[8,11,13] Most staff categories were also vaccinated against HBV. This is an important IPC measure seen in studies in Saudi Arabia, the Dominican Republic and the Mediterranean have noted and recommended HBV vaccination.[7-9,14] The 20% of staff who were unvaccinated received their vaccination for HBV once they presented to the IPC Department and once they were seronegative for the virus. This is standard practice at the SGH's IPC Department. However, this highlights that vaccination drives are important at the hospital and for new staff. Source patients cannot always be tested, as in this study. A number of injuries or exposures could not have a source patient data. In some cases, the source may be unknown, such as a needle stick occurring from suture equipment left unattended or while the cleaning staff were removing dirty items and subsequently sustained injury. This makes staff reporting of these incidents and the management important for optimal employee health, safety and protection.

The data from this epidemiologic study can be used for quality improvement in reducing sharp injuries similar to that seen using EPINet and the RCN's "Be Sharp Be Safe" campaign. Interventions such as using closed systems, instead of recapping may be useful. In addition, the category of staff for targeting is now better understood. Rice et al recommends employers should adopt safety-engineered devices, institute safe

systems of work and promote adherence to standard infection control procedures.[13] Vaccinations, recruiting the best quality of staff, safe medical instruments, implementing continuous employee training (as well as proper "on boarding") and continuous training can help reduce occupational blood borne pathogen exposures.[5,8,13] Akpinar-Elci et al, from conducting training and limited studies in the Caribbean indicates that the lack of knowledge and awareness of needle stick injuries contributes greatly to underreporting and the lack of policies and procedures. Trinidad and Tobago has policies and procedures but inconsistent recording of data and significant missing data, as with various data fields, in this study, can be a hindrance to sharp injury and slash injury prevention strategies.[5] Thus, infection prevention and control professionals must be continuously trained to properly record the data at the SGH.

This study was limited by being a retrospective review of notes. Prospective interviews of staff at the points and time of injury can improve data quality, as well as training of IPC staff in the use of the data collection instrument in the National Infection Prevention and Control Policies and Guidelines Manual, as mentioned. Healthcare workers' fear of discrimination may be a barrier to healthcare workers reporting injuries. Targeted intervention was started in 2017 at the Hospital site and included: tool box talks, educational campaigns, staff meetings, staff trainings such as appropriate handling of waste or appropriate care bundles (due to the large number of sharp injuries on fingers) and citations for outstanding performance by a unit. Non-sharp injuries such as splash injuries were also noted as a secondary objective and should also be examined and targeted for intervention. We recommend further studies into this issue, which crosses the disciplines of IPC and occupational health.

CONCLUSION

Sharp injuries were shown to be increasing at the study site. These injuries were most common in the late morning. Sharp injuries in employees were most common in internal medicine and general surgery wards. These injuries were most common on the fingers. Only one exposed employee seroconverted over the entire period, thus seroconversion can occur but was
uncommon.

Ethical Approval statement: This study was approved by the ethics committees of the University of the West Indies, St Augustine and the Eastern Regional Health Authority's Ethics Committee.

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Authors Contribution: Rajeev Peeyush Nagassar conceptualised, analysed the data and reviewed the final manuscript. Roma Jaanki Bridgelal-Nagassar conceptualised, analysed the data and reviewed the final manuscript. Saskia Ramkissoon conceptualised, reviewed the final manuscript and analysed the data. Keston Daniel analysed the data and reviewed the final manuscript.

References

1. World Health Organization. Needle sticks injuries. Protecting health-care workers - preventing needle stick injuries. 2020. Accessed [9th June 2020]. Available from: https://www.who.int/occupational_health/topics/needinjuries/en/
2. Pan American Health Organization. Regional goals for human resources for health 2007–2015. (Working Document CSP27). Washington, D.C.: PAHO; 2007. Accessed [9th June 2015] .Available from: http://iris.paho.org/xmlui/handle/123456789/4157
3. Watterson L. Monitoring sharps injuries: EPINet surveillance results. *Nurs Stand*. 2004; 19(3):33-8.
4. Sharp and sharps injuries: avoiding the risk in clinical practice. *Nursing times*. 2004. Accessed [21st January 2019]. Available from: https://www.nursingtimes.net/needlestick-and-sharps-injuries-avoiding-the-risk-in-clinical-practice/199744.article
5. Akpinar-Elci M, Bidaisee S, Durgampudi P, Radix R, Rodriquez-Guzman J, Nguyen MT, et al. Needlestick injury prevention training among health care workers in the Caribbean. *Rev Panam Salud Publica*. 2018; 42:e93. https://doi.org/10.26633/RPSP.2018.93
6. Chadee DD, Edwards JR, Sharma K, Shivnath B. Inoculation injuries in hospitals in Trinidad and Tobago. *West Indian Med J*. 1999; 48(4):227-230.
7. Ministry of Health. Infection Prevention and Control Policies and Guideline for Health Care Services. Port

of Spain: Ministry of Health, Trinidad and Tobago; 2011.
8. Alay H, Şahiner M, Çelik N and Göktuğ Kadioğlu B. Evaluation of Injuries Involving Exposure to Blood and Body Fluids among Hospital Healthcare Workers. *Mediterr J Infect Microb Antimicrob*. 2017; 6:8.
9. Al Wutayd O, AlRehaili A, AlSafrani K, Abalkhail A, AlEidi SM. Current Knowledge, Attitudes, and Practice of Medical Students Regarding the Risk of Hepatitis B Virus Infection and Control Measures at Qassim University. Open Access *Maced J Med Sci.* 2019; 7(3):435-439. Published 2019 Feb 10.
10. Mandić B, Mandić-Rajčević S , Marković-Denić L and Bulat P. Occupational exposure to blood and bodily fluids among healthcare workers in Serbian general hospitals. *Arch Ind Hyg Toxicol*. 2017; 69 (1): 61 – 68.
11. Balouchi A, Shahdadi H, Ahmadidarrehsima S, Rafiemanesh H. The Frequency, Causes and Prevention of Needle stick Injuries in Nurses of Kerman: A Cross-Sectional Study. *J Clin Diagn Res*. 2015; 9(12): DC13–DC15.
12. Mason K. Accident patterns by time-of-day and day-of-week of injury occurrence*. J. Occup. Accid*. 1979; 2 (20): 159-176.
13. Rice BD, Tomkins SE, Ncube FM. Sharp truth: health care workers remain at risk of blood borne infection. *Occup Med* (Lond). 2015; 65(3):210-214. doi:10.1093/occmed/kqu206
14. Moro PL, Moore A, Balcacer P, et al. Epidemiology of needle sticks and other sharps injuries and injection safety practices in the Dominican Republic. *Am J Infect Control*. 2007; 35(8):552-559. doi:10.1016/j.ajic.2007.06.001