OCCUPATIONAL NEEDLE STICK INJURIES AMONGST PREHOSPITAL EMERGENCY MEDICAL SERVICE PERSONNEL IN SOUTH AFRICA

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A Research Report submitted to the Faculty of Health of the University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Science in Emergency Medicine

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DECLARATION

I, Jared Ryan McDowall, hereby declare that this research report is my own work and has not been submitted or presented for any other degree or professional qualification at this or any other Institute. This research was undertaken in the Division of Emergency Medicine, University of the Witwatersrand, Johannesburg.

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SUBMISSION FORMAT OF THIS RESEARCH REPORT

As per University of the Witwatersrand Faculty of Health Sciences guidelines, this research report is being submitted in the following format: manuscript accepted for publication.

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ACCEPTED MANUSCRIPT

TITLE OF MANUSCRIPT

Occupational Needle Stick Injuries amongst prehospital Emergency Medical Service Personnel in Johannesburg

RUNNING TITLE

Prehospital needle stick injuries in Johannesburg

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The authors hereby certify that this submission is not under publication consideration elsewhere and is free from any conflict of interest.

AUTHOR CONTRIBUTIONS

Jared McDowall – Primary author, study design and data analysis and manuscript write up.

Abdullah Laher – Assisted with study design, data analysis, interpretation of results and preparation of manuscript.

SUBMISSION LETTER TO THE EDITOR

Dear Editor- The "African Journal of Emergency Medicine":

Thank you for considering our article entitled: "Occupational Needle Stick Injuries (NSI) amongst prehospital Emergency Medical Service Personnel in Johannesburg". The occurrence of NSI among healthcare providers (HCPs) is well documented. Complications following NSI include HIV and Hepatitis seroconversion. Apart from the therapy required in its management, NSI also carries a medico-legal liability in cases of delay, omission or neglect.

The burden of occupational NSI is well documented in developed countries. The incidence among South African HCPs is poorly documented. This includes the incidence, risk factors, post exposure prophylaxis guidelines and compliance, as well as common characteristics among HCPs that are exposed to NSI.

We are certain that this article will appeal to the readership of the "African Journal of Emergency Medicine". Furthermore, it carries a high citation potential, as it is applicable to those in the fields of Emergency Medicine, Trauma, Infectious Diseases, HIV Medicine and Prehospital Medicine.

ABSTRACT

Introduction: Prehospital personnel are frequently exposed to challenging situations that place them at increased risk of sustaining a needle stick injury (NSI). Blood borne infections such as HIV and Hepatitis B or C may be transmitted from a NSI. Sub-Saharan Africa has the largest number of people living with HIV globally. There is no data pertaining to NSI among Emergency Medical Service (EMS) personnel in South Africa. This study aimed to investigate the cumulative incidence, knowledge, attitudes and practices pertaining to NSI's amongst a select group of prehospital EMS personnel in Johannesburg.

Methods: This was a prospective, questionnaire based, cross-sectional survey of personnel employed at three EMS service provider in Johannesburg.

Results: Of the 240 subjects that participated in the study, there was a total of 93 NSI's amongst 63 (26.3%) subjects. Of these, 41 (65.1%) had sustained only one previous NSI, 16 (25.4%) had two previous NSI's, 5 (7.9%) had three previous NSI's and one (1.6%) had five previous NSI's. Almost two-thirds (n=60; 64.5%) of NSI's were sustained during intravenous line insertion. Most of the study subjects were male (n=145, 60.4%), between the age of 25-29 years (n=67, 27.9%), had a BLS qualification as the highest level of training (n=89, 37.1%), had >10 years of EMS experience (n=69; 28.8%) and were up to date with their Hepatitis B vaccination at the time of the study. HIV post exposure prophylaxis (PEP) was initiated in 82 (88.2%) out of the 93 NSI incidents. However, the recommended 28-day course of therapy was only completed in 68 (82.9%) out of the 82 cases where PEP was initiated.

Conclusion: Prehospital personnel are at high risk of sustaining a NSI. There is a need to promote awareness with regards to the risks, preventive measures, awareness of PEP protocols and the timely initiation and completion of HIV PEP amongst EMS personnel in Johannesburg.

KEY WORDS

needle stick injury; percutaneous injury; EMS; emergency medical services; HIV; post exposure prophylaxis; PEP

INTRODUCTION

Percutaneous injury or needle stick injury (NSI) can be defined as a puncture wound to the skin or mucous membrane with an unsterilized or contaminated instrument or object [1]. Rates of NSI differ among doctors, nurses and prehospital Emergency Medical Services (EMS) providers [2–4]. The annual incidence of NSIs has been reported as 1.34 per 100 hospital beds and 1.22 per 100 nurses [3]. Twenty percent of EMS providers in California had sustained a NSI over a 12 month period [4].

Shift work, long working hours, unfamiliar environments and uncontrolled working conditions predispose EMS healthcare workers to NSIs [5,6]. Transmission of HIV, Hepatitis B virus (HBV) and Hepatitis C virus (HCV) infections are the major concerns after sustaining a NSI. The risk of seroconversion following a NSI is highest for HBV (6%-30%) followed by HCV (0.5%-10%) and is lowest for HIV (0.3%) [7]. Since the seroprevalence of HIV infection in South Africa is among the highest in the world [8,9] with approximately one-fifth of the adult population being infected [9], transmission of HIV after a NSI is a major concern. In general, most post exposure prophylaxis (PEP) protocols predominantly focus on reducing the risks of HIV transmission [10,11].

There is limited data available on NSIs amongst South African EMS providers[12]. Since EMS personnel in South Africa generally have a broad scope of practice, we hypothesized that the prevalence of NSIs is high. We, therefore, aimed to investigate the cumulative incidence, knowledge, attitudes and practices pertaining to NSIs amongst a select group of prehospital EMS personnel working in Johannesburg.

METHODS

This prospective questionnaire based cross-sectional study was conducted between- 17 January to 25 October 2018. The study population comprised a convenience sample of 240 EMS personnel, employed at one of three EMS service providers in Johannesburg. A total of 300 questionnaires were distributed, yielding a response rate of 80%. Students and other healthcare professionals not employed at any of the three EMS service providers were not eligible to participate in the study. Permission to conduct the study and ethical clearance was obtained from each of the service providers and the University of Witwatersrand Human Research and Ethics Committee (certificate M170512) respectively. Potential study subjects were approached at Continuous Medical Education (CME)/Continuous Professional Development (CPD) events and/or their operation base. Subjects were given an information sheet outlining the study details. Consenting subjects were requested to complete the anonymous questionnaire that was placed in an envelope and handed out to them by the primary investigator. Participant confidentiality and anonymity was maintained throughout the study.

The questionnaire was based on the knowledge, attitudes and practice (KAP) model. It included questions pertaining to gender, age, qualifications, experience and the number of NSIs sustained over the duration of the subjects' career, how was the NSI sustained, HIV and Hepatitis virus testing following a NSI, aspects pertaining to HIV PEP, perceived risk factors for a NSI, awareness of the availability of a NSI policy at the work place, personal practice following a NSI, perceived risk of acquiring Hepatitis virus or HIV infection following a NSI and Hepatitis B virus vaccination status.

Collected data was captured into an electronic data spread sheet for analysis (Microsoft® Excel®). STATA®, version 13, software was used to perform all statistical analyses. Since the data was mostly categorical in nature, results were predominantly described using frequency and percentage tables.

RESULTS

A total sample of 240 subjects participated in the study. There was a total of 93 NSIs amongst 63 (26.3%) subjects. Of these 63 subjects, 41 (65.1%) had sustained only one previous NSI, 16 (25.4%) had two previous NSIs, 5 (7.9%) had three previous NSIs and 1 (1.6%) had five previous NSIs. Therefore, a total of 22 (34.9%) subjects had sustained more than one NSI. All NSIs were sustained over the duration of the subjects' career.

Table 1 describes the cause of each of the 93 NSI incidents that were sustained by subjects over the duration of their career. There was a total of nine different causes that were reported. Of note, almost two-thirds (n=60; 64.5%) of NSIs were sustained during intravenous line insertion. The frequencies of all causes are summarized in the table.

Table 1: Aetiology of the ninety-three needle stick injury incidents

Aetiology of NSI	**n (%)**
Intravenous line insertion	60 (64.5)
Finger prick for glucose testing	17 (18.2)
Suturing of wounds	5 (5.3)
Arterial blood gas sampling	3 (3.2)
Venous blood gas sampling	2 (2.2)
Contaminated glass at trauma scene	2 (2.2)
Overfilled sharps container	2 (2.2)
Intramuscular injection	1 (1.1)
Surgical cricothyroidotomy	1 (1.1)

Most of the subjects that participated in the study were male (n=145, 60.4%), between the age of 25-29 years (n=67, 27.9%), had a BLS qualification as the highest level of training (n=89, 37.1%), had >10 years of experience (n=69; 28.8%) and were up to date with their

Hepatitis B virus vaccination at the time that the study was conducted. Table 2 describes gender, age, qualification, experience and Hepatitis B virus vaccination status of study subjects.

Table 2: Description of gender, age, qualification, experience and Hepatitis B virus vaccination status of study subjects

Variable	**Sustained ≥1 NSI over duration of career**	**Did not sustain NSI over duration of career**
	n (%)	**n (%)**
Gender		
Female	69 (38.9)	26 (41.2)
Male	108 (61.0)	37 (58.7)
Age group (years)		
18-24	31 (17,5)	11 (17,4)
25-29	52 (29,4)	15 (23,8)
30-34	38 (21,5)	10 (15,9)
35-39	11(6,2)	8 (12,7)
40-44	8 (4,5)	8 (12,7)
>45	8 (4,5)	4 (6,3)
Highest level of qualification		
BLS	76 (42,9)	13 (20,6)
ILS	61 (34.5)	22 (34,9)
ALS	20 (11,3)	14 (22,2)
ECT	6 (3,4)	1 (1,6)
ECP	14 (7,9)	13 (20,6)
Years of experience		
<1-year	10 (5,6)	1 (1,6)
1-2 years	28 (15,8)	5 (7,9)
3-5 years	53 (29,9)	15 (23,8)
6-10 years	44 (24,9)	15 (23,8)
>10 years	42 (23,7)	27 (42,9)
Hepatitis B virus vaccination status		
Up to date	115 (65,0)	44 (69,9)
Not up to date	37 (20,9)	15 (23,8)
Not sure	25 (14,1)	4 (6,3)

BLS- Basic Life Support, ILS- Intermediate Life Support, ALS- Advanced Life Support, ECT- Emergency Care Technician, ECP- Emergency Care Practitioner

Table 3 describes HIV and Hepatitis B virus testing of subjects following the 93 NSI incidents. Overall, a higher proportion of subjects had tested for HIV than for Hepatitis B virus. Within 72 hours following the NSI, most subjects (n=89; 95.7%) had underwent testing for underlying HIV infection, whereas only 62 (66.7%) had tested for underlying Hepatitis B virus infection. At the 6-week, 4-month and 12-month intervals after the NSI, incrementally fewer subjects had undergone testing.

Table 3: HIV and Hepatitis B virus testing of participants following a needle stick injury

Recommended testing times	**HIV testing n (%)**	**Hepatitis B virus testing n (%)**
Within 72 hours of incident	89 (95,7)	62 (66,7)
6 weeks after incident	66 (71,0)	32 (34,4)
4 months after incident	52 (55,9)	19 (20,4)
12 months after incident	37 (39,8)	19 (20,4)

Initiation, drug regimen utilized, and compliance with HIV PEP is described in Figure 1. Overall, HIV PEP was initiated in 82 (88.2%) out of the 93 NSI incidents. However, the recommended 28-day regimen was only completed in 68 (82.9%) incidents. Among the 63 subjects that had experienced only one NSI, the majority initiated (n=55; 87.3%) and had completed (n=47; 85.5%) the 28-day PEP regimen. Whereas, amongst the 22 subjects that had experienced a second NSI, 19 (85.7%) initiated PEP and 15 (78.9%) completed the regimen. All the 6 subjects that had experienced a third NSI had initiated PEP, however, only 4 (66.7%) completed the regimen. The one participant that had experienced a fourth and fifth NSI had initiated and completed the recommended regimen of PEP after both NSI episodes.

Of the 82 incidents where PEP was initiated, subjects were not aware of the constituents of the prescribed antiretroviral regimen in 37 (45.1%) cases. Of the remaining 45 (54.9%) cases, an AZT (Zidovudine) based regimen was prescribed in 31 (68.9%) cases whereas TDF (Tenofovir) and D4T (Stavudine) based regimens were prescribed in 12 (26.7%) and 2

(4.4%) cases respectively. Twenty-three (51.1%) subjects reported that they were not prescribed a third agent, whereas 18 (19.4%) were unsure if a third agent was prescribed. Of the remaining 4 (8.9%) subjects, 3 (6.7%) had used Lopinavir/Ritonavir and 1 (2.2%) had used Atazanavir/Ritonavir as the third antiretroviral agent.

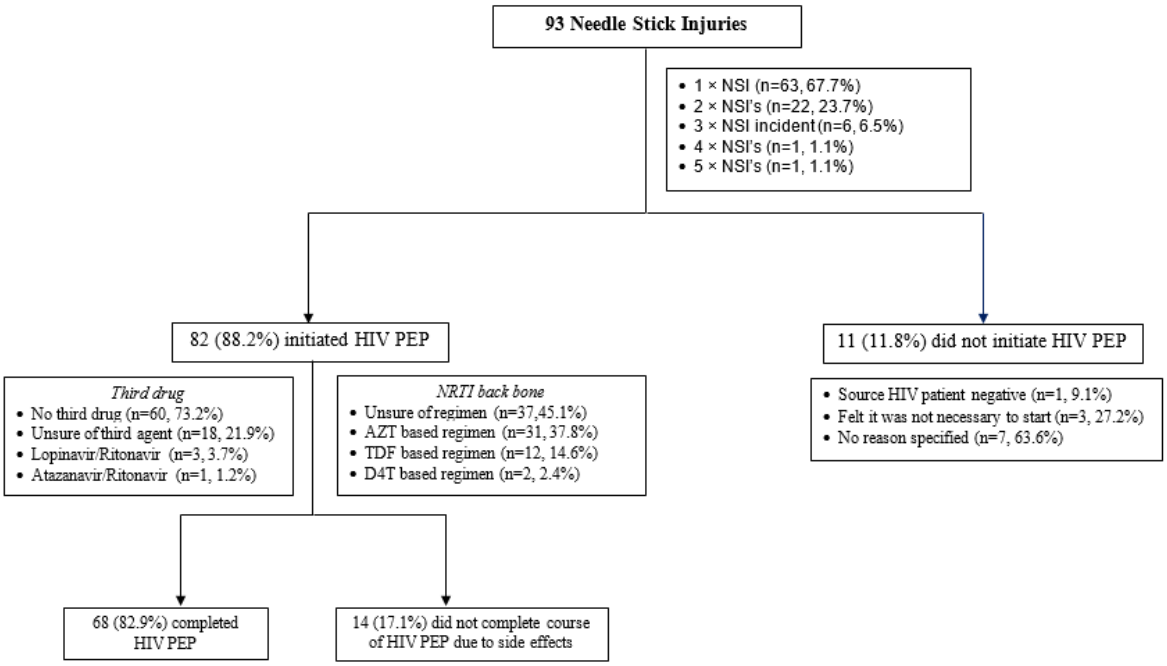

Figure 1: Initiation, compliance and selection of antiretroviral therapy amongst study subjects that had experienced a needle stick injury

Table 4 summarises the responses of subjects regarding personnel/staff members and various scenarios that were perceived as high risk for sustaining a NSI. About 40% (n=98) of subjects believed that inexperienced staff were at high risk of sustaining a NSI while less than 10% of subjects reported that doctors, nurses, all EMS personnel (except ILS personnel) and managers were at high risk of sustaining a NSI. Regarding high risk scenarios; exhaustion, managing an intoxicated patient, managing a psychiatric patient and personal inexperience were perceived by approximately two-thirds of subjects as high-risk scenarios for sustaining a NSI.

Table 4: Personnel and scenarios that were perceived as high risk for sustaining a needle stick injury

Description	**n (%)**
Personnel at high risk of sustaining a needle stick injury	
Inexperienced staff members	98 (40,8)
Students	82 (34,2)
ILS	37 (15,4)
Males	33 (13,8)
Females	30 (12,5)
Experienced staff members	27 (11,3)
Nurses	26 (10,8)
ECP	22 (9,2)
ALS	22 (9,2)
ECT	15 (6,3)
BLS	13 (5,4)
Doctors	10 (4,2)
Management	6 (2,5)
Scenarios associated with a high risk of sustaining a needle stick injury	
Exhaustion	163 (67,9)
Managing an intoxicated patient	160 (66,7)
Managing a psychiatric patient	158 (65,8)
Personal inexperience	152 (63,3)
Stress	119 (49,6)
Rotational shift work	39 (16,3)

ILS- Intermediate Life Support, ECP- Emergency Care Practitioner, ALS- Advanced Life Support, ECT- Emergency Care Technician, BLS- Basic Life Support

Most subjects (n=219; 91.3%) reported that their company/organisation had a policy or standard operating procedure in place following a NSI. Three (1.3%) subjects reported that this was not available, whereas 18 (7.5%) subjects were unsure if this was available. Most subjects also reported that they were aware of what to do following a NSI (n=224; 93.3%). Following a NSI, the majority of subjects indicated that they would a) report the incident to their manager (n=237; 98.7%), b) determine the source patient's HIV and Hepatitis virus infection status (n=210; 87.5%), c) undergo a Hepatitis B and C virus screening test immediately (n=200; 83.3%) and d) undergo a HIV screening test immediately (n=214; 89.2%).

Approximately half the number of subjects (n=125; 52.1%) reported that the risk of acquiring Hepatitis B or C virus infection following a NSI was higher, whereas about a third reported that the risk of acquiring HIV (n=83, 34.6%) was higher and 32 (13.3%) were unsure. Despite the perceived risk, only 159 (66.3%) subjects were up to date with their Hepatitis B virus vaccinations at the time that the study was conducted. Fifty-two (21.6%) were not up to date and 29 (12.1%) were unsure of vaccination status.

DISCUSSION

From initiation of their career until the date of data collection, more than a quarter of respondents (26.3%) had experienced at least one NSI. Comparatively, a study conducted in California, USA that enrolled 2664 subjects reported that 20% of EMS providers were exposed to a NSI within a 12 month period [4]. Another smaller study conducted by Alhazmi et al. in West Virginia (USA), noted a NSI incidence of 18.21% amongst 248 EMS personnel [13]. Higher incidences of NSIs amongst health care workers have been reported in Iran and Nigeria [14,15]. Since the likelihood of sustaining a NSI is higher with a longer duration of exposure, a likely reason for the higher incidence of NSIs in this study is that participants reported on the total number of NSIs over the span of their career. In comparison, most of the other studies reported on the incidence of NSIs over a 12-month period.

In a questionnaire-based study in Pakistan amongst healthcare workers who reported a NSI, 73% had reported more than one NSI [16]. Comparatively, approximately a third (34.9%) of NSI victims in this study had reported more than one NSI. Targeting modifiable risk factors such as poor working environments, long working hours, shift work, understaffing, lack of a sharps container, recapping of used needles, mental stress and physical stress [5,6,17,18] as

well as non-modifiable risk factors such as increased patient load and a sense of urgency within the workplace [6] may reduce the risk of NSIs in EMS workers.

In contrast to international findings, where hypodermic injections (intramuscular, subcutaneous and/or intra-dermal injections) were reported as the most common cause of NSIs [2,17], almost two-thirds (64.5%) of NSIs in this study were sustained during intravenous line insertion. Compared to other countries, intravenous line insertion and various other procedures are frequently performed by EMS personnel in South Africa [19].

There were no significant differences between age groups with regards to the cumulative incidence of NSIs in this study. In contrast, other studies noted a higher incidence of NSIs among older EMS personnel and females [4,13]. There are no obvious reasons that may have accounted for the lack of difference noted in our study. In keeping with findings of other studies [4,13], our study also showed that EMS personnel with greater experience were more likely to have sustained a NSI. Although this may seem surprising, our findings can be attributed to the fact that a longer career would provide more opportunity for sustaining a NSI. Unfortunately, our study did not evaluate the number of NSIs sustained in the last year of service.

Since the HIV seroprevalence in South Africa is known to be high [9,20], it is concerning that 4.3% of study subjects did not undergo testing for HIV within the first 72 hours following a NSI. Even more concerning, is the fact that incrementally fewer individuals underwent testing at the recommended 6-week (71.0%) and 4-month (55.9%) follow-up intervals. Possible reasons for this may be due to a lack of awareness of local protocols, negative HIV status of the source patient or that the subjects had forgotten to perform repeat testing.

Several South African studies have shown that amongst the general population, basic knowledge regarding HIV infection is fairly good, however, knowledge regarding the prevalence of HIV infection and personal risk is lacking [21].

In this study, substantially fewer NSI victims had been tested for Hepatitis virus serology as compared to HIV serology. Lack of awareness coupled with the fact that most guidelines predominantly focus on HIV PEP as opposed to Hepatitis virus [10,11] are plausible reasons. Another potential reason for the low rates of Hepatitis virus testing in this study could be that some of the study subjects were aware of their immunity status and may have not deemed it necessary to undergo testing. This, however is concerning as the prevalence of Hepatitis B virus in South Africa is relatively high (1-10%) and Hepatitis B virus is known to be more readily transmitted than HIV [7,22].

Approximately half the number of participants (n=125; 52.1%) reported that the risk of acquiring Hepatitis virus infection following a NSI was higher, whereas about a third reported that the risk of acquiring HIV (n=83, 34.6%) was higher. The erroneously higher perceived risk of HIV transmission in this study may be as a result of greater media coverage and emphasis on HIV due it its high prevalence in the region.

The recommended 28-day regimen of HIV PEP was only completed by 82.9% of NSI victims in this study with the adverse effect profile being reported as the commonest reason for non-compliance. Similarly, other international studies have also reported adverse effects of HIV PEP medication as the chief reason for poor compliance and failure to complete the recommended duration of prophylaxis. This may be mitigated by administering newer drug regimens which have been associated with more tolerable adverse effects (e.g. Raltegravir)

[23]. Due to cost constraints, these newer drug regimens have only recently been made available in public sector facilities locally (personal communication with local department of health personnel).

Subjects in this study perceived that inexperienced staff (n=40.8%) and students (n=34.2%) were at highest risk for NSIs. These findings are in keeping with other international studies [4]. Other perceived risk factors such as exhaustion, managing an intoxicated patient, managing a psychiatric patient and personal inexperience have also been reported in other studies [4,6,24].

The fact that almost 10% of study subjects reported that there was either no NSI policy or they were not aware of a NSI policy at their workplace is concerning. This finding suggests that educational programs regarding NSIs aimed at EMS personnel may be suboptimal. The development and implementation of frequent practical based educational programs to identify and correct suboptimal practices among healthcare providers has been strongly recommended [6,17]. Furthermore, the use of safety engineered needle devices have also been shown to reduce the risk of NSIs among healthcare providers [17].

LIMITATIONS

This is a regional study which comprised of 240 subjects among a population of almost 70 000 EMS personnel across South Africa. Hence, our findings may not be representative of the practices and perceptions of EMS personnel in general. Also, since this was a questionnaire-based study, findings were based on data that was self-reported by study subjects. Hence, recall bias may limit our findings. Furthermore, as convenience sampling was used there is an

inherent risk of selection bias. In addition, due to the blind nature of data collection, questions posed were open to individual interpretation. This may have also led to bias.

CONCLUSION

Prehospital personnel are at high risk of sustaining a NSI. There is a need to promote awareness in the prehospital environment. Risks, safe practices, preventive measures, awareness of protocols and the timely initiation and completion of HIV PEP must be emphasized.

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RESEARCH PROTOCOL

Occupational needle stick injuries among South African Emergency Medical Service personnel

Research protocol in partial fulfilment of the degree for Master of Science in Medicine (Emergency Medicine)

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INTRODUCTION

Percutaneous injury (PI) or needle stick injury (NSI) can be described as a puncture wound in the skin with an unsterilized or contaminated instrument. Emergency Medical Service (EMS) providers are often called in emergency situations. Personnel are exposed to many environments; as a result, they are exposed to different risk factors. Emergency Medical Service management may include intravenous access. This has been described as a common risk factor that may lead to NSI.[1] The rate of NSI among Health Care Workers (HCW) varies.

The rate of NSI differs among doctors, nurses and EMS providers. A study conducted in California found that 20% of EMS providers were exposed to NSI within a 12 month period.[2] Further risk factors and patterns emerged from the study.

It was noted that one population was more prone to NSI ; the inexperienced health care provider (HCP).[2] A study conducted in South Korea reported a 70% rate of NSI injury among inexperienced nurses within a year.[3] Inexperience coupled with age was another risk factor for NSI. Further risk was identified in a Taiwanese study, it was noted that older and less experienced EMS providers were at risk of NSI.[4] The converse was also noted, in the presumed young, student population.

Training to become a HCP entails practical exposure in order to obtain experience. As a result, this may predispose individuals to NSI. Students from a single Health Sciences institution in Iran reported an incidence of 40% NSI between 2012 and 2013.[5] Age and experience are not the only Risk factors associated with NSI.

There have been further risks factors identified that predispose HCW to NSI. Shift work, exhaustion, proximity of disposal bins, the practice of recapping needles and working in the Accident and Emergency department have all been described as risk factors for NSI.[1] Following NSI, it may predispose HCW to different viruses. There have been several reported cases of Hepatitis B (HBV) and Hepatitis C (HCV) infection following NSI. The source of NSI has been associated with work practice and intravenous access. [6] Another risk following NSI is Human Immunodeficiency Virus (HIV) infection.

Human Immunodeficiency Virus (HIV) is a pandemic, affecting people around the world. Although unlikely, there are reported cases of HIV infection following NSI. [7] In order to mitigate HIV, HBV and HCV infection there are recommended Post Exposure Prophylaxis (PEP) protocols.

According to World Health Organization (WHO) standards, there is a prescribed PEP protocol. The PEP protocol is a predetermined set of medications that are to be given to HCW should they have been exposed to a NSI. There also needs to be screening for HBV and HCV, these guidelines are not clear.[7] Following NSI and PEP, there have been reported cases of PEP non-compliance.

Post exposure prophylaxis non-compliance among HCW was associated with adverse events from the medications, lack of access and the negative stigma surrounding HIV.[8,9] Both HIV and PEP have implications on government expenditure.

It was estimated that NSI alone, would account for 100-400 million dollars in expenditure in the United States of America in 2007. Of which, 96% would be used for testing and prophylaxis, the remainder estimated for chronic HBV, HCV and HIV management.[10] There is very little local data describing rates of NSI among HCW, risk factors, HIV, HBV, HCV and the potential socio-economic implications.

There is no data available on NSI among the South African EMS population. Rates of HIV infection in South Africa is among the highest in the world.[11,12] In other countries, where rates of HIV infection are not as high, the potential cost of NSI has been investigated. This study aims to investigate the prevalence of NSI among an isolated prehospital EMS environment and relate it to international findings.

STUDY AIM AND OBJECTIVES

Study aim

The aim of the study is to investigate occupational needle stick injuries within the South African prehospital Emergency Medical Service (EMS) environment.

Study objectives

1. To describe the incidence of occupational needle stick injuries among EMS providers in Johannesburg.
2. To compare the incidence of injuries prequalification to post qualification.
3. To describe risk factors leading to needle stick injury.
4. To describe compliance with Post Exposure Prophylaxis (PEP) protocols.
5. To determine common characteristics among providers that got needle stick injury/injuries.

METHODS

Study design

Prospective, observational, transverse, survey based descriptive design.

Study site

The study will be conducted in one government and two private EMS providers in Johannesburg.

Government:

- City of Johannesburg EMS

Private:

- Netcare 911
- ER24

Study population

Emergency Medical Service personnel working within the above-mentioned EMS provider/s, irrespective of qualification.

Inclusion criteria

Emergency Medical Service personnel employed by the above-mentioned EMS provider/s.

Exclusion criteria

Students, other healthcare professionals and observers that may be present on shift but are not employed by the above-mentioned healthcare providers.

Sample size

The sample size is aimed for 240 participants. Latest, available statistics from the Health Professions council of South Africa (HPCSA) indicated that there was a total of 70520 registered personnel on HPCSA EMS register, as of May 2016. If students are removed (part of exclusion criteria, a total of 1815 students), a total of 68705 personnel remain.[13] In order to obtain a confidence interval of 95%, with a margin of error of 7%, a sample size of 196 participants are required.[14] This number was increased to 240 participants as the researcher felt it was obtainable.

Data collection

- The researcher will obtain approval from the EMS provider/s to conduct the research in the service.
- Once approval has been obtained from the EMS provider/s, the researcher will approach potential participants whilst they are on duty.

- Potential participants will be given an information form outlining the study. Due to the blind nature of data collection, no signed consent will be required.
- A questionnaire will be given to potential participants in a sealed envelope. The researcher will leave the room. The questionnaire will be completed by willing participants. On completion of the questionnaire, participants will place the questionnaire in to a sealed box. Information collected, will remain confidential.
- Each participant will be allocated a participant number in order to ensure anonymity, i.e. PN1.
- Once the study has been completed, a copy of the results will be sent to the EMS provider/s and participants upon request.

DATA ANALYSIS

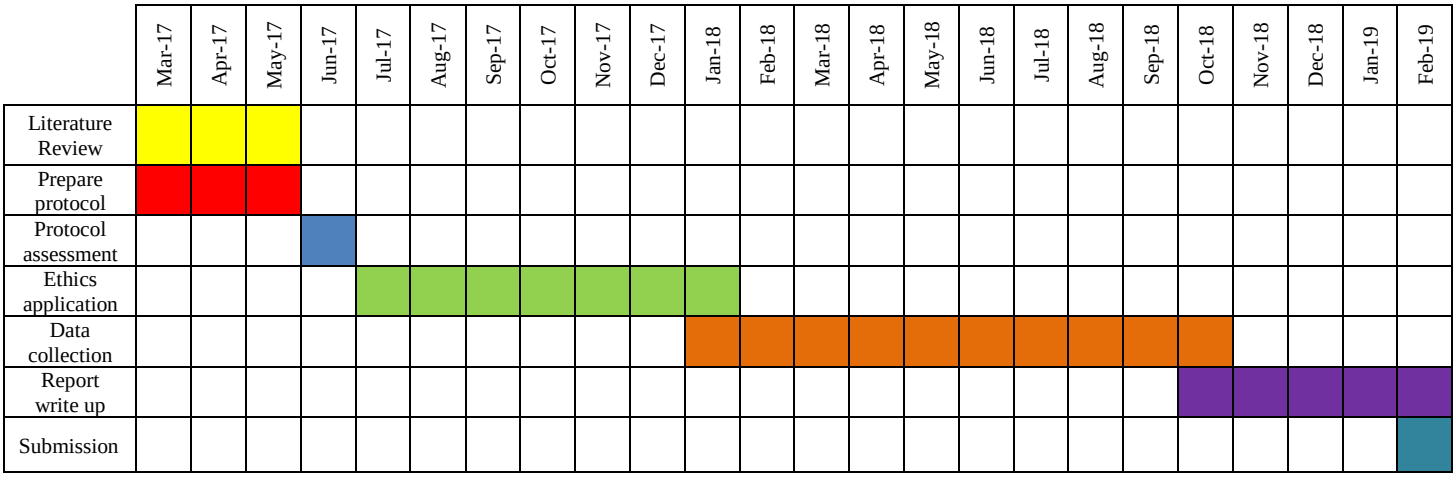
Data collection is estimated to take six months. All data recorded will be entered in to an electronic data spread sheet for analysis (Microsoft® Excel®). STATA ® version13 software will be used to perform all statistical analyses. Statisticians employed by the University of Witwatersrand will be approached for assistance. Continuous data (qualifications, years of experience, number of NSI Etc) will be described with mean, median and range.
Knowledge of PEP protocol and non-compliance with PEP will be described by frequency and percentages. Data will be tabulated; histograms and bar charts will be used to illustrate data as appropriate.

ETHICS

Ethical approval for the study will be obtained from the University of Witwatersrand Human Research Ethics Committee. Permission to conduct the study will be obtained from the

above-mentioned EMS provider/s. Participants will provide written consent once they have read the information and consent form.

TIMING



FUNDING

The research will be self-funded with an estimated cost as follows:

Stationery and printing	6000-00
Petrol	7000-00
TOTAL	**13000-00**

LIMITATIONS

The only anticipated limitation is that of incomplete questions/questionnaires.

REFERENCES

1. Bekele T, Gebremariam A, Kaso M, Ahmed K. Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in bale zone, Southeast Ethiopia. PLoS One 2015;10(10):e0140382.
2. Boal WL, Leiss JK, Ratcliffe JM, Sousa S, Lyden JT, Li J, et al. The national study to prevent blood exposure in paramedics: Rates of exposure to blood. Int Arch Occup

Environ Health 2010;83(2):191–9.

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4. Wu FF-S, Wu M-W, Chou Y-H, Ting M-H, Siebers R. Incidence of percutaneous injuries and non-reporting rates among first-aid responders in Taiwan. J Occup Environ Hyg 2012;9(9):535–7.
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7. Hanrahan A, Reutter L. A Critical review of the literature on sharps injuries: epidemiology, management of exposures and prevention. J Adv Nurs 1997;25(1):144–54.
8. Zelnick J, O'Donnell M. The Impact of the HIV/AIDS Epidemic on Hospital Nurses in KwaZulu Natal, South Africa: Nurses' Perspectives and Implications for Health Policy. J Public Health Policy 2005;26(2):163–85.
9. Hiransuthikul N, Hiransuthikul P, Kanasuk Y. Human immunodeficiency virus postexposure prophylaxis for occupational exposure in a medical school hospital in Thailand. J Hosp Infect 2007;67(4):344–9.
10. Leigh JP, Gillen M, Franks P, Sutherland S, Nguyen HH, Steenland K, et al. Costs of needlestick injuries and subsequent hepatitis and HIV infection. Curr Med Res Opin 2007;23(9):2093–105.

11. Statistics South Africa. Mid-year Population estimates. 2015.

12. WHO. Number of people (all ages) living with HIV Estimates by WHO region [Internet]. Glob. Heal. Obs. data Repos.2015 [cited 2017 Mar 5]; Available from: http://apps.who.int/gho/data/view.main.22100WHO?lang=en

13. HPCSA. South African Health Care provider Statistics [Internet]. [cited 2017 Mar 9]; Available from: http://www.hpcsa.co.za/Publications/Statistics

14. Sample Size Calculator [Internet]. 2015. [cited 2017 Mar 5]; Available from: Http://www.calculator.net/sample-size-calculator.html?type=1&cl=95&ci=5&ps=5732+&x=98&y=17.

STUDY INFORMATION SHEET

Dear prospective participant,

My name is Jared Ryan Mc Dowall and I am enrolled in the Master of Science in Medicine (Emergency Medicine) program at the University of Witwatersrand. As a requirement for the degree, I am required to do a research project.

The title of my study is:
Occupational needle stick injuries among South African Emergency Medical Service personnel

You are invited to participate in this study as a professional in your field and would be contributing to the knowledge base in the profession. Through your involvement, you may help determine future occupational health and safety regulations within the Johannesburg prehospital environment.

Your participation in this research study is voluntary. You may choose not to participate. If you decide to participate in this research, you may withdraw at any time. If you decide not to participate in this study, or if you withdraw from participating at any time, you will not be penalized.

Participation involves completing a self-administered questionnaire. Questions included are demographic, dichotomous, multiple choice and open-ended questions. It will take approximately 10-15 minutes to complete. Your responses will remain confidential and no identifying information will be collected (i.e. name, email...etc.). Once the researcher has explained the contents of the questionnaire, he will leave the room. On completion of the questionnaire, participants are required to put their questionnaires in to a sealed box. The researcher is the only person who will have access to the contents of the box. It is requested that you do not disclose any of the information to any other parties.

The Human Research Ethics Committee of the University of Witwatersrand has approved the study. Should you have any queries please contact Professor P. Cleaton Jones on 0117171234.

You are free to withdraw from the research at any point. A copy of the results is available upon request following completion of the study. If you have any questions following completion of the questionnaire, please contact me at 0829576518 or jmc_dowall@icloud.com. My research Supervisor is Dr. Abdullah Laher and he can be reached at 0848402508 or abdullahlaher@msn.com.

Thank you for your time and willingness to participate.

QUESTIONNAIRE
Participant no: _____

Instructions:

- Please mark with an 'X' where appropriate.
- Please complete questionnaire where appropriate.

Demographics

GENDER				RACE							
Male		Female		African		Caucasian		Indian		Mixed race	

AGE:	
18-24	
25-29	
30-34	
35-39	
40-44	
>45	
Age not specified	

Question 1:
What is your highest qualification? Please indicate with an 'X' in the table below:

Basic Life Support provider	
Intermediate Life Support provider	
Emergency Care Technician	
Emergency Care Practitioner	
Advanced Life Support provider/paramedic	

Question 2:
How many years of experience (in total, irrespective of qualification/s) do you have in the Emergency Medical Services? Please indicate your years of experience in the table below:

<1year		1-2 years		3-5 years		6-10 years		>10 years	

Question 3:
Who do you think is at highest risk of Needle stick injuries? Please indicate in table below (can mark more than one option).

Females		Students		ECT staff		Experienced staff		BLS staff		
Males		Doctors		ALS staff		Inexperienced staff		ILS staff		
Management		Nurses		ECP staff						

Question 4:
Does the company you work for have a policy or standard operating procedure in place following a needle stick injury?

YES		NO		Not sure	

Question 5:
Do you know what to do following a needle stick injury?

YES		NO	

Question 6:
In the event of a needle stick injury, which of the following would you do?

Report the incident to management?	YES		NO	
Want to know the Hepatitis infection status of the source?	YES		NO	
Want to know the HIV infection status of the source?	YES		NO	
Undergo Hepatitis B & C screening immediately?	YES		NO	
Undergo Hepatitis B & C screening immediately?	YES		NO	
Undergo HIV screening test immediately?	YES		NO	

Question 7:
Which of the following risk factors predispose Emergency Medical Service personnel to a possible needle stick injury? Please mark with an 'X' where appropriate (Can answer with more than one option).

Stress		Exhaustion		Inexperience		Shift work		Drugs	
Intoxicated patients				Psychiatric patients					

Question 8:
Which of the following, would you have a higher risk (statistically) of contracting following a needle stick injury?

HIV		Hepatitis		Not sure	

Question 9:
Are you up to date with your Hepatitis vaccinations?

YES		NO		Not sure	

Question 10:
Have you ever had a needle stick injury?

YES		NO	

The following sections are to be completed by participants that <u>have</u> had a needle stick injury/injuries. If not, please hand in your questionnaire to the researcher. Thank you

Question 11:
Can you provide further information about the needle stick injury/injuries? Please mark with an 'X' where appropriate.

Incident number	**Incident reported**		**Hepatitis screening**		**Up to date with Hepatitis vaccinations (at time of incident)?**		**HIV screening**		**Post exposure prophylaxis (PEP) taken?**		**PEP compliant (course completed)**		**Qualification at time of needle stick injury?**	
1	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Student	Qualified
2	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Student	Qualified
3	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Student	Qualified
4	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Student	Qualified
5	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Student	Qualified

Question 12:
When did you go for HIV and Hepatitis screening? Please mark with an 'X' where appropriate.

	HIV Screening							
Incident number	**Within 72 hours of incident**		**6 weeks after incident**		**4 months after incident**		**12 months after incident**	
1	Yes	No	Yes	No	Yes	No	Yes	No
2	Yes	No	Yes	No	Yes	No	Yes	No
3	Yes	No	Yes	No	Yes	No	Yes	No
4	Yes	No	Yes	No	Yes	No	Yes	No
5	Yes	No	Yes	No	Yes	No	Yes	No

	Hepatitis Screening							
Incident number	**Within 72 hours of incident**		**6 weeks after incident**		**4 months after incident**		**12 months after incident**	
1	Yes	No	Yes	No	Yes	No	Yes	No
2	Yes	No	Yes	No	Yes	No	Yes	No
3	Yes	No	Yes	No	Yes	No	Yes	No
4	Yes	No	Yes	No	Yes	No	Yes	No
5	Yes	No	Yes	No	Yes	No	Yes	No

Question 13:
What circumstances led to the needle stick injury? Please mark with an 'X' and complete where appropriate.

Incident number	**Lancet injury (HGT testing)**	**Intravenous Access**	**Arterial blood gas sampling**	**Venous blood gas sampling**	**Other (please specify)**
1					
2					
3					
4					
5					

Question 14:
Did you start a course of antiretroviral therapy (ART)? If so, how many courses of ART did you go on and were you compliant? Please indicate with an 'X' where appropriate.

Incident number	**One course ART**		**Second course ART**		**Third course ART**		**ART compliant throughout?**	
1	Yes	No	Yes	No	Yes	No	Yes	No
2	Yes	No	Yes	No	Yes	No	Yes	No
3	Yes	No	Yes	No	Yes	No	Yes	No
4	Yes	No	Yes	No	Yes	No	Yes	No
5	Yes	No	Yes	No	Yes	No	Yes	No

Question 15:
What course of antiretroviral therapy did you go on? Please indicate with an 'X' where appropriate.

	Incident Number				
	1	**2**	**3**	**4**	**5**
AZT / 3TC (or emtricitabine)					
TDF / 3TC (or emtricitabine)					
D4T / 3TC (or emtricitabine)					
Other (please specify below with incident number/s)					
Do not know					

Question 16:
Did you use a third agent during your PEP protocol?

	Incident Number				
	1	**2**	**3**	**4**	**5**
No, I did not					
Raltegravir					
Lopinavir/Ritonavir					
Atazanavir/Ritonavir					
Other (Please specify below with incident number/s)					

_____

_____

Question 17:
If you **did not** complete the course of prescribed antiretroviral therapy, please outline reasons why in the table below.

Medication side effects		Cost		Other (please specify below)		Not applicable	

_____

_____

APPENDIX 1: ETHICS CLEARANCE CERTIFICATE

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Mr JR McDowall

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M170512

NAME: (Principal Investigator)	Mr JR McDowall
DEPARTMENT:	School of Clinical Medicine Department of Emergency Medicine
PROJECT TITLE:	Occupational needle stick injuries amongst South
DATE CONSIDERED:	26/05/2017
DECISION:	Approved unconditionally
CONDITIONS:	Applies to employees of Netcare 911, ER24 and CoJEMS. Netcare 911 added to this amended Certificate on 15/01/2018
SUPERVISOR:	Mr A Laher
APPROVED BY:	Professor CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	30/08/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on 3rd floor, Phillip V Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/We fully understand the conditions under which I am/we are authorised to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated from the research protocol as approved, I/we undertake to resubmit to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. in this case, the study was initially reviewed in **May** and will therefore be due in the month of **May** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

APPENDIX 2: TURN-IT-IN-REPORT

ORIGINALITY REPORT

8%	6%	5%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Abdullah E. Laher, Yousef Etlouba, Muhammed Moolla, Feroza Motara, Nazeema Ariefdien. "First-presentation with psychotic behavior to the Emergency Department: Meningitis or not, that is the question", The American Journal of Emergency Medicine, 2018 Publication	1%
2	Louis Gerber, Abdullah E. Laher, Callistus O.A. Enyuma, Jared McDowall, Sunday J. Aigbodion, Sean Buchanan, Ahmed Adam. "The 'John Thomas' sign and pelvic fractures—Fact or humorous myth?: A systematic review and meta-analysis", Journal of Clinical Orthopaedics and Trauma, 2017 Publication	<1%
3	Kong, Yoon Jin, Hye Sun Choi, Jae Woo Jang, Sung Joo Kim, and Sun Young Jang. "Surgical Outcomes of Canalicular Trephination Combined with Endoscopic Dacryocystorhinostomy in Patients with Distal	<1%