Percutaneous injuries in doctors in the School of Medicine, University of the Free State: incidence, reporting and adherence to precautionary and management procedures

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Abstract

Background: Despite the official precautionary measures against percutaneous injuries, incidents still occur. Consequently, it is possible that healthcare workers could contract infections like HBV, HCV, HGV (hepatitis B, C and G viruses) and HIV (human immune deficiency virus). The most serious problem lies in the fact that percutaneous injuries are often underestimated, resulting in non-reporting of the incident. The aim of this study was to determine the incidence of percutaneous injuries in doctors in the School of Medicine at the University of the Free State (UFS), whether the incidents were reported, and the reasons for non-reporting. The use of gloves during procedures was also evaluated.

Methods: A mainly descriptive study design was used. Questionnaires were administered from October 2006 through January 2007 to collect information. Participants were selected randomly, and the respondents were divided into surgical and non-surgical groups.

Results: The respondents fulfilled the following roles and/or functions in their respective departments of employment: 35 (67.3%) were registrars, 12 (23.1%) were specialists/consultants, four (7.7%) were medical officers, and one (1.9%) was exclusively involved in student training. Two of the respondents did not indicate their roles and functions in their respective departments. A total of 82 incidents of percutaneous injuries occurred. Although the surgical groups handled sharp objects more frequently per week than the non-surgical groups (p-value = 0.04), more incidents occurred in the non-surgical groups (p-value = 0.02). Only 39 (47.6%) of the incidents were reported, while 44.4% of the respondents were aware of the correct reporting procedures. The reasons given for the non-reporting of these incidents were "too busy" (58.1%), "did not think it was serious" (48.8%), and "was not aware of the reporting procedures" (7%). Only 13.7% of the respondents indicated that they always used gloves when drawing blood, 17.4% used them when injections were administered, and 22.4% used gloves during intravenous cannulation. However, 86.8% of the respondents wore gloves when they used a scalpel or any other incision object. The respondents (n = 51) suggested that the three most important precautionary measures to take into consideration when working with sharp objects were (i) the use of gloves (23/51; 45.1%), (ii) never recapping a needle (9/51; 17.6%), and (iii) keeping the container for disposing of sharp objects close at hand (6/51; 11.8%).

Conclusions: Despite the risk of percutaneous injuries, non-reporting still occurs. Although the rate of reporting these incidents could be compared with international findings published in the literature, it remains too low. Drastic measures should be taken to ensure that physicians are informed of the hazards of percutaneous injuries, as well as of the appropriate mechanisms of reporting these incidents.

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Introduction

Percutaneous injuries are defined as occupation-related, unintentional injuries that break the integrity of the skin, and include needle prick injuries (hollow or solid needles), incision object injuries (e.g. scalpels), or any other sharp object injuries (e.g. glass, empty ampoules).[1] Percutaneous injuries are classified into three categories, namely:

- Superficial injuries: no or little bleeding present
- Mild/moderate injuries: bleeding present
- Serious injuries: deep penetration resulting in severe bleeding[1]

High-risk percutaneous injuries are caused by hollow, blood-contaminated needles.[1] Hepatitis B (HBV), Hepatitis C (HCV) and HIV are among the most serious infections that could be acquired through needle prick or sharp object injuries. These infections pose a serious risk to healthcare workers, as they are potentially life threatening and are associated with a high morbidity and mortality.[2–6]

The risk of occupation-associated infection by a blood-borne pathogen is directly related to three factors:[1,7]

- The extent of exposure to blood or body fluids
- The prevalence of patients in the clinical setting who carry pathogens
- The risk of infection transmission with pathogen-contaminated substances, in other words the seroconversion rate

According to a study published in 2001 that pooled data from several studies, the seroconversion rate for HIV is 0.3% (95% confidence interval, 0.2 to 0.5) after percutaneous exposure to HIV-infected blood, and approximately 0.09% (95% confidence interval, 0.006 to 0.5)

after mucous membrane exposure.[8,9] In other words, about one out of every 330 HIV-contaminated hollow needle prick injuries will result in a positive test for the development of anti-HIV antibodies. Seroconversion rates of HBV and HCV are much higher, namely 6% to 30% and 3% to 10% respectively.[9,10,11] Seroconversion also depends on the viral load in body fluids.

The World Health Organization (WHO) estimates that 32% of new HBV infections, 40% of new HCV infections, and 5% of new HIV infections in developing countries could be attributed to healthcare-related contaminated injections.[12]

Precautionary measures and management procedures differ from hospital to hospital, but certain practices are generally applicable, as outlined in the document issued by the Free State Department of Health, "Management of Occupational Exposures to HIV, HBV, HCV and Recommendations for PEP (post-exposure prophylaxis)".[13] Despite the official protective measures against percutaneous injuries, accidents still occur. An estimated 59% of percutaneous injuries could potentially be prevented.[1]

In a study conducted by a group of otorhinolaryngologists, it was found that percutaneous injuries were mostly associated with winged-type needles (31.3%), suturing needles (16.7%), hollow needles (35.4%), incision instruments (4.2%), and other sharp instruments (12.5%).[8] These researchers also found that 58% of injuries occurred when the object causing the injury was in the hand of the injured person, 29% when in the hand of a bystander, and 13% when it was on a procedure table or a bed.[8]

The hazards associated with these types of injuries are often underestimated. Various studies have been conducted on the prevalence and reporting of percutaneous injuries, as well as on the respondents' knowledge of the related risks. An investigation involving medical students in Virginia, USA found that 43% of percutaneous injuries were reported,[14] while another study, also amongst medical students, that was conducted in Nice, France found that 39% of these incidents were reported and that fewer than 50% of the respondents were aware of the risks involved.[15] In the Netherlands, an investigation that included healthcare workers who had been working in so-called AIDS-endemic areas in Africa found that 61% of percutaneous injuries were reported.[16] In Tanzania it was found that the average healthcare worker experienced an average of five needle prick injuries and nine splash contaminations per year.[17] In a study involving healthcare workers that was conducted in Cambridge, England, 80% of the respondents indicated that they were aware of the risks associated with percutaneous injuries. Nevertheless, only 51% of incidents were reported.[18] From an investigation conducted amongst a group of surgeons in the USA, it was found that only 17% of percutaneous injuries were reported.[10]

In order to limit the risk of percutaneous injuries, certain health precautions and safer alternative instrumentation have been implemented globally.[19–23] Despite the guidelines and notification procedures for healthcare workers, non-reporting still occurs, and this prompted certain questions: Why are cases not reported? Are healthcare workers aware of the applicable safety precautions? Are these precautions followed appropriately? Are healthcare workers aware of the procedures and guidelines that should be followed in the event of a percutaneous injury? And finally, are these guidelines applied?

Percutaneous injuries are potentially dangerous, pose physical as well as emotional risks, and may result in considerable financial expenses for both the state and the individual.

The aim of this study was to determine the incidence of percutaneous injuries among doctors in the School of Medicine at UFS. These doctors play an important role in public hospitals in Bloemfontein and are also involved in the training of future doctors. It was also investigated how many of these injuries were reported and, if not, what the specific reasons were for non-reporting of the incident. If percutaneous injuries were reported, it was investigated whether the appropriate notification procedures were followed.

Methods

A mainly descriptive study design was employed. The study focused on doctors in the School of Medicine, UFS, which provided a target population of approximately 400 doctors. No distinction was made with regard to gender, race, culture or language. Name lists of the doctors were provided by the Faculty of Health Sciences administration. Potential participants were allocated numbers and were then selected randomly. It was endeavoured to recruit 80 participants, but 54 eventually participated. Recruitment of the participants was performed over a four-month period (October 2006 to January 2007).

A self-administered questionnaire was compiled for the collection of data. An effort was made to work through the questionnaire with each participant, but this was not practical due to time constraints on the part of the participants.

For comparative purposes, respondents were divided into surgical and non-surgical groups based on the specific departments in which they were employed in the School of Medicine. The **surgical group** consisted of participants from the departments of Anaesthesiology, Cardiothoracic Surgery, General Surgery, Neurosurgery, Obstetrics and Gynaecology, Ophthalmology, Orthopaedics, Otorhinolaryngology, Reconstructive Surgery and Urology. Participants in the **non-surgical group** were from the departments of Anatomical Pathology, Cardiology, Dermatology, Diagnostic Radiology, Family Medicine, Haematology and Cell Biology, Internal Medicine, Medical Microbiology, Neurology, Oncotherapy, Paediatrics, Pharmacology and Psychiatry.

Before the main project was conducted, a pilot study was performed with four participants from the Department of Haematology and Cell Biology. Feedback with regard to any problems, shortcomings and ambiguity, as well as recommendations, was provided in writing. The necessary changes were made to the study methodology, informed consent form and questionnaire.

Permission for the investigation was granted by the Head of the School of Medicine, UFS, and ethical approval was obtained from the Ethics Committee of the Faculty of Health Sciences. Written consent was obtained from all the participants. Each participant also received a copy of an information document expounding the importance of the study. It was emphasised that participation was voluntary and could be terminated at any stage during the study. Confidentiality and anonymity were ensured. No person received any compensation for participating in the study.

Results

A total of 112 doctors were approached with questionnaires, 54 of whom responded, giving a response rate of 48.2%. The age of the participants ranged between 26 and 63 years, with a median of 33 years. The number of years practising medicine, which included internship years and 2006, ranged from three to 38 years, with a median of eight years.

All the respondents had a basic MBChB degree. Fifty per cent (27/54) of the respondents had an additional qualification, of which 17 (31.5%) were MMed degrees in various disciplines. Thirty-eight (70.4%) of the respondents were busy with further studies. The respondents fulfilled the following roles and/or functions in their respective departments of employment: 35 (67.3%) were registrars (i.e. specialists in training), 12 (23.1%) were specialists/consultants, four (7.7%) were medical officers, and one (1.9%) was exclusively involved in student training. Two of the respondents did not indicate their roles and functions in their respective departments.

Table I shows that respondents from the surgical group handled sharp objects more frequently ($p = 0.04$), but that the respondents from the non-surgical group more frequently reported a history of sharp object injuries ($p = 0.02$). However, the total number of incidents was the same in the two groups.

Table I: Handling of sharp objects and injuries among surgical versus non-surgical respondents

	Surgical group	Non-surgical group	Total
Number of respondents	28 (51.9%)	26 (48.1%)	54 (100%)
Handling of sharp objects > 30 times per week	10 (35.7%)	3 (11.5%)	13 (24.1%) p = 0.0379
Number of respondents with a history of sharp object injuries	14 (50%)	21 (80.8%)	35 (64.8%) p = 0.018
Total number of incidents	41	41	82
Ratio of incidents to all respondents	1.46	1.58	
Ratio of incidents to respondents with a history of sharp object injuries	2.93	1.95	

Of the 82 sharp object injuries that occurred, 39 (47.6%) were reported. The reasons given for non-reporting of these incidents varied between "too busy" (58.1%), "did not think it was serious" (48.8%), and "was not aware of the reporting procedures" (7%). According to suggestions made by some of the respondents (n = 51), the three most important precautionary measures to take into consideration when working with sharp objects were the use of gloves (23/51; 45.1%), never recapping a needle (9/51; 17.6%), and keeping the container for disposing of sharp objects close at hand (6/51; 11.8%).

Table II shows the relationship between the use/non-use of gloves during procedures involving sharp objects and the occurrence of percutaneous injuries.

Respondents who did not always use gloves when performing these procedures could select more than one option from a list of possible reasons on the questionnaire. Ten of the 45 respondents (22.2%) who did not always use gloves during procedures indicated that they were allergic to the powder in the gloves, 35 (77.8%) said the gloves hampered the use of instruments, and nine (20%) pointed out that gloves were not readily available.

Table II: Use of gloves and occurrence of percutaneous injuries during different procedures involving sharp objects

	Drawing of blood	Administering injections	Intravenous cannulation	Use of scalpel or incision instrument
Number of respondents always using gloves during procedure	n = 51 7 (13.7%)	n = 46 8 (17.4%)	n = 49 11 (22.4%)	n = 53 46 (86.8%)
Number of respondents with a history of sharp object injury and always using gloves during procedure	n = 32 4 (12.5%)	n = 28 4 (14.3%)	n = 30 7 (23.3%)	n = 34 30 (88.2%)
Number of incidents in respondents always using gloves during procedure	n = 75 5 (6.7%)	n = 64 4 (6.3%)	n = 72 18 (25%)	n = 80 74 (92.5%)

The questionnaire also evaluated the respondents' knowledge of the procedure to be followed when reporting percutaneous injuries. It was found that only 44.4% of the respondents knew the correct procedure.

Discussion

The reasons for the low response rate included refusal by doctors to participate, being too busy, the fact that data collection occurred over holiday times and the beginning of a new year, the final-year medical students' examination, and failure to follow up on questionnaire recipients due to time constraints.

Certain measuring and methodological errors could have occurred during the execution of this study. There could possibly have been recall bias, since the incidents cited by the respondents took place between 1990 and 2007. Due to the layout of the questionnaire, certain items were unintentionally omitted by some participants. This could have been prevented if it had been possible to work through the questionnaire with each participant. Certain items were ambiguous or interpreted incorrectly by some of the participants.

The majority of respondents were registrars (35/52; 67.3%), which explains the median age of 33 years and the median of eight years in medical practice. It is presumed that the incidence of percutaneous injury incidents and non-reporting of these incidents might increase if more consultants and medical officers had participated in the study. Since registrars are still busy with training, they might have been more inclined to report these incidents.

From the comparison of the surgical and non-surgical groups shown in Table I, it could be concluded that although respondents from the surgical group handled more sharp objects per week than those from the non-surgical group ($p < 0.04$), the surgical group had a lower number of percutaneous injury incidents than the non-surgical group ($p < 0.02$). Several factors, such as expertise and cautiousness, could possibly play a role in this observation.

From the ratios pointed out in Table I, it could be concluded that an equal number of incidents occurred in both the surgical and non-surgical

groups, but that there was a sharp increase in incidents in the surgical group if the respondent had been injured previously. It is difficult to give an explanation for this observation, since various factors such as age, the specific department in which the respondent was employed, and the particular individual, would have to be taken into account.

The non-reporting of percutaneous injuries reported in this study is comparable to worldwide tendencies, although a higher report rate could be expected in view of the higher prevalence of life-threatening infections, such as HIV and HBV, in South Africa than in the other countries where similar studies were carried out. An interesting study in Kenya showed that healthcare workers' fear of HIV testing and a perception that percutaneous injuries carry a low risk were important reasons for non-reporting of injuries. This was only ascertained after in-depth interviews.[24]

The fact that only 44.4% of the respondents were well informed about the correct procedure to follow when reporting a percutaneous injury is a source of concern. Urgent attention should be given to this aspect to ascertain that doctors have the necessary information at their disposal.

The use of gloves as a basic precautionary measure in the prevention of infections that could be acquired through percutaneous injuries is generally accepted as the norm,[2,10,19,25,26] and was also noted as such by the respondents. Despite this, the results portrayed in Table II clearly indicate that gloves are not used that frequently when basic procedures, such as drawing of blood and intravenous cannulation, are performed.

A disturbing observation was that 20% of the respondents who did not always use gloves when performing procedures indicated that the reason for this was that gloves were not always readily available. This information was reported to the particular heads of department so that the problem could be addressed.

An investigation to determine the incidence of percutaneous injuries and reporting of incidents among senior medical students is strongly recommended. Many basic procedures are performed by medical students and not medical officers or registrars. It is also recommended that the findings of this study are made known to medical students in order to promote their awareness of the risks associated with percutaneous injuries.

Conclusion

The best way of preventing infection by HIV and other blood-borne pathogens is through safer practices, the prevention of blood exposure when using needle devices and through barrier precautions.[9,27]

Despite the precautionary measures and reporting guidelines that are in place with regard to percutaneous injuries, these incidents still occur.[28] The problem of greatest concern, however, is that these injuries are often underestimated, resulting in non-reporting. Although the rate of reporting found in this study corresponds to international trends, it remains too low. It is every physician's responsibility to be informed about the reporting procedures, and to report these incidents.

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Conflict of interest

We declare that we have no financial or personal relationship(s) that may have inappropriately influenced us in writing this paper.

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