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Frequency of sharp injuries among nurses, underreporting and availability of safety devices – importance of training

Częstość zranień ostrymi narzędziami wśród pielęgniarek, niezgłaszanie przypadków oraz dostępność bezpiecznych narzędzi – potrzeba szkoleń

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Abstract

Introduction and Objective. Needlesticks and injuries caused by sharp instruments constitute a significant occupational risk problem in the work of nurses; their number, however, is underestimated worldwide. The aim of the study is to assess the frequency and structure of needlestick and sharps injuries (NSIs) analyse their reporting, assess availability of safety devices, and check whetherf training affects NSIs reporting and use of safety devices.

Materials and Method. In 2021, a cross-sectional study was conducted with an online questionnaire among 200 nurses from the Łódź Province in Poland. The data were statistically analysed using descriptive methods. Pearson's chi-squared test and Fisher›s exact probability test to compare the distribution of qualitative variables. The workplace, type of department, seniority and workplace location were related to the frequency of contact with potentially infectious material (PIM).

Results. The study shows that unpredictable behaviour of a patient was the most common cause of injury, about 40% of nurses did not report NSIs, and 20.5% of nurses had never experienced NSIs. Nurses who had received infection prevention training and those who had undergone post-exposure training in the past year were more likely to report NSIs. Most of the participants confirmed availability of safety devices, but the problem was that one in four nurses stated that they did not willingly use safety devices. The nurses who confirmed that training in the use of safety devices took place at work were more likely to use them. Most of the nurses had no influence on the type and quality of purchased safety devices.

Conclusions. Emphasis should be placed on increasing NSIs reporting and the hospital management taking into account nurses' views of safety devices, which can be assisted by systematic training.

Key words

nurses, training, underreporting, safety devices, sharps injuries, needlestick

Streszczenie

Wprowadzenie i cel pracy. Zakłucia igłami oraz zranienia ostrymi narzędziami stanowią istotny problem, wpisując się w ryzyko zawodowe związane z pracą pielęgniarek, a ich liczba jest niedoszacowana na całym świecie. Celem badania była ocena częstości i struktury zranień ostrymi narzędziami, analiza zgłaszania ostrych zranień, ocena dostępności bezpiecznych narzędzi oraz próba weryfikacji, czy szkolenia wpływają na zgłaszanie incydentów ostrych zranień i używanie bezpiecznych ostrych narzędzi.

Materiał i metody. Badanie przekrojowe przeprowadzone w 2021 roku wśród 200 pielęgniarek z województwa łódzkiego za pomocą kwestionariusza ankiety udostępnionego drogą internetową.

Wyniki. Zmienne, takie jak miejsce pracy, rodzaj oddziału czy staż pracy, powiązano z częstością kontaktu z potencjalnie zakaźnym materiałem. 20,5% pielęgniarek nigdy nie doświadczyło zranienia ostrym narzędziem. Najczęstszą przyczyną ostrych zranień było nieprzewidywalne zachowanie pacjenta. Około 40% pielęgniarek nie zgłaszało incydentu zranienia ostrym narzędziem. Pielęgniarki, które odbyły szkolenie w zakresie zapobiegania infekcjom, oraz te, które w roku poprzedzającym badanie przeszły szkolenie poekspozycyjne, częściej zgłaszały ostre zranienia. Większość uczestniczek badania potwierdziła dostępność urządzeń zabezpieczających, ale niestety co czwarta pielęgniarka stwierdziła, że niechętnie używała bezpiecznych narzędzi. Częściej z bezpiecznych narzędzi korzystały pielęgniarki, które potwierdziły, że szkolenia w zakresie stosowania zabezpieczeń odbywały się w pracy. Większość pielęgniarek nie miała wpływu na rodzaj i jakość zakupionych narzędzi bezpiecznych.

Wnioski. Należy położyć nacisk na zwiększenie sprawozdawczości ostrych zranień oraz na uwzględnianie opinii pielęgniarek na temat wyrobów zabezpieczających. Pomocne w tym mogą być systematyczne szkolenia pielęgniarek.

Słowa kluczowe

pielęgniarki, szkolenia, zakłucia, zgłaszanie, ostre zranienia, bezpieczny sprzęt

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INTRODUCTION

Occupational risk is the probability of undesirable events related to performed work [1]. The occurrence of adverse events in the workplace may result in serious consequences which significantly deteriorate the health condition of employees. As a professional group, the members of a medical staff are exposed to many factors that are highly harmful and onerous, including biological, physical, chemical and psychosocial. Daily work with patients means that biological agents are the greatest threat to medical workers, with nurses being the occupational group subject to the most frequent exposures [1–2]. Injections are one of the most common health care procedures administered annually worldwide. Most injections (90%) are administered for therapeutic reasons, and only 5% for immunization [3]. Healthcare workers (HCWs) face occupational risks of needlestick and sharps injuries (NSIs), which may potentially cause occupationally acquired viral infections, for example, those due to the hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) [4–5].

In Poland, approximately 100 injuries occur every day in healthcare facilities as a result of medical equipment use by healthcare workers That means that there are 12–30 needlestick injuries per 100 hospital beds per year [1]. The degree of threat from biological factors is classified on the basis of their tendency to cause a disease in humans, ability to spread in the environment and possibility of using appropriate methods of prevention and treatment. Due to the possibility of causing infection, the biological factors are divided into four groups, the third group of which can pose a great threat to health, and result in the severe course of a disease. The prevalence of those factors in the population is very high (e.g. *Mycobacterium tuberculosis*, HBV, HCV and HIV). In the case of the second and third groups, prophylaxis and treatment methods are used. In Poland, the most common occupational diseases among nurses include tuberculosis, HCV and HBV [6].

Uncontrolled NSIs during medical procedures in the group of infected patients are the main cause of diseases in medical personnel. There are various risk factors for acute injuries which include lack of knowledge and experience in providing nursing care, anxiety, and unfamiliarity with the clinical environment. Therefore, nursing students and nurses with less experience (especially with ≤5 years of experience) may be more at risk of injury [7–8]. Moreover, an insufficient number of nurses is a factor that may increase the risk of infection. Such a situation may lead to a greater workload, which may result in increased stress during performed activities, which, in turn, leads to inappropriate adherence to medical procedures. Risk factors also include the lack or improper use of personal protective equipment [9]. The application of safe medical equipment significantly reduces the risk of uncontrolled NSIs, which, in turn, translates into the elimination of nosocomial infections. A German study showed a 21.9% decrease in NSIs per year after introducing equipment with solutions protecting against injury [10]. After safe solutions were introduced, the exposure rate decreased from 3.4 to 1.5 per 100 workers [11]. Similar results were obtained in an Australian study [12].

European regulations require the prevention of sharps injuries in health care facilities through obligatory NSIs reporting and providing workers with safe devices [13]. Unfortunately, the regulation on compulsory reporting of injuries seems not to be observed (mainly by HCWs themselves). Moreover, research on HCWs› knowledge and opinions on the use of safe tools is still lacking. Therefore, the objectives of this study are:

- to analyse the frequency and structure of NSIs among nurses;
- to analyse NSIs reporting;
- to assess the availability of safety devices and relationship between respondents' access to safety devices and the frequency of injuries;
- to check whether training affects the frequency of injury reporting and use of safety devices.

MATERIALS AND METHOD

A cross-sectional study was conducted from February – May 2021 using an online questionnaire among nurses. Due to the ongoing Covid-19 pandemic, it was impossible to carry out a face-to-face survey and direct contact with medical workers was limited to a minimum. For this reason, the questionnaire was made available online in Google Forms and on social networks amongin professional groups intended for nurses). Due to the link to the questionnaire being placed on social groups, it was difficult to assess how many nurses did not participate in the study. Each participant was informed about complete anonymity and voluntary participation, and the possibility to withdraw from the study at any time. Due to the nature of the study, no consent of the Bioethical Committee was required.

Research tool. For the purposes of the study, a questionnaire consisting of single and multiple-choice questions was used. The first part of the survey included questions on the frequency of nurses' exposure to blood-borne potentially infectious material. The injury frequency was analysed in two ways. First, the overall injury incidence was determined by enquiries about injury incidents that occurred in the course of the participant's professional career. The participants were asked how often they were exposed to potentially infectious material (PIM), and how often they were injured. Subsequently, to determine the structure of the injuries (type of injury, body part exposed, etc.), the questionnaire elicited information about injury incidents that had occurred in the 12 months prior to the study. In that part of the questionnaire, only those who had suffered an injury in the last year preceding the survey replied. We asked nurses whether they reported injuries and the reasons for under-reporting.

The survey also included questions related to the availability of safety devices, and enquired whether nurses participated in training in post-exposure procedures and the use of safety devices, as well as the frequency of trainings and when they participated in such training.

The second part of the questionnaire included data concerning gender, seniority, primary workplace, and location (large city – 100,000 inhabitants and over, small city – fewer than 100,000 inhabitants; and village).

Statistical analysis. The data were statistically analysed using descriptive methods. Additionally, the created database enabled carrying out a statistical analysis for specific statistical variables (seniority, primary workplace, location). Due to the fact that women constituted 95% of the respondents, no

relationship was calculated with regard to the gender variable. For the location variable, the data were aggregated to obtain two features (large city, n=145 and small city + village, n=45). Also used were variables: training in infection prevention in the workplace, training in post-exposure procedures, and the duration of the training, as well as training in the use of safe equipment.

Pearson's chi-squared test and Fisher's exact probability test served to compare the distribution of qualitative variables. Fisher's test was calculated for groups < 5. In both tests, the null hypothesis on the correlation of the analysed variables was rejected for p<0.05. Statistical analysis was performed using STATA 17 software (StataCorp LLC, USA).

RESULTS

Characteristics of the study group. A total of 220 questionnaires were collected, of which 20 were rejected. The exclusion criterion was indicating a province other than Łódź in Poland. Ultimately, the study group consisted of 200 nurses from the Łódź Province only. Among them, the vast majority were women with 6–15 years of work experience, employed in hospital departments, with a substantial majority working in a large city (Tab. 1).

Table 1. Sociodemographic characteristics of participants (n=200, %)

Variables	Respondents N=200	
	n	%
Gender		
Female	195	97.5
Male	5	2.5
Primary workplace		
Hospital	158	79.0
including surgical departments	89	
and non-surgical departments	69	
Ambulatory care	42	21
Work seniority (years)		
<5	38	19.0
6–15	74	37.0
16–25	65	32.5
>25	23	11.5
Location of the workplace		
Large city	155	77.5
Small city	42	21.0
Village	3	1.5

Frequency of contact with PIM and frequency of NSIs. Half of the nurses declared contact with blood or other PIM at least several times a day. The most frequent contact with body fluids was experienced by staff working in the surgical departments of hospitals (Tab. 2). Nurses from large cities declared statistically significantly more common contact with PIM (Fisher's exact test p = 0.003). Seniority was related to the frequency of contact with potentially infectious material (Chi^2=22.67; p=0.031). Respondents with longer experience more often indicated increased contact with PIM.

Table 3 presents characteristics of NSIs in the study group. The frequency of injuries differed among nurses with different seniority and in different workplaces. At the same time, no relationship was found between the frequency of NSIs and the type of department in hospitals. Only one in five nurses (n=41, 20.5%) had never experienced NSIs (Tab. 3).

Table 4 shows the frequency of superficial and deep injuries among nurses which occurred during the year preceding the study. There was no statistically significant relationship between the nurse's workplace and the frequency of superficial and deep injuries. Nurses with longer work experience more often indicated the occurrence of superficial wounds, but such a relationship was not demonstrated when analysing the frequency of deep injuries (Tab. 4).

Structure of NSIs. The wound structure was analysed on the basis of information about the last injury incident remembered by the nurse. That part of the questionnaire was answered by 159 of the respondents. The vast majority declared that NSIs concerned a finger, and were caused by using a syringe needle. Activities during which the injury occurred were mainly blood sampling, although several nurses were injured while replacing the needle cover.

The nurses indicated the unpredictable behaviour of a patient as the most common cause of injury. The remaining structure and circumstances are listed in Table 5.

Under-reporting. Fewer than half of the nurses immediately reported NSIs to the person responsible for post-exposure prophylaxis at the workplace (n=89; 44.5%). Every tenth nurse (n=27; 13.5%) reported NSIs after an interval. Furthermore, for various reasons, 42% of nurses did not report the injury incident to anyone:
- 'I did not report NSIs because nothing results from these reports' (n=63; 31.5%);
- 'because I did not see any threat' (n=14; 7%);
- 'because I did not know to whom I should report such an incident' (n=7; 3.5%).

The reporting rate depended on seniority (chi^2=21.526; p=0.043), but did not depend on the workplace location, and did not differ between nurses from large and smaller towns. Nurses who participated in occupational infection prevention

Table 2. The workplace and structure of frequency of contact with PIM (n=200, %)

	Frequency of contact with PIM					
Primary workplace	Several times a day n(%)	Several times a week n(%)	Several times a month n(%)	Several times a year n(%)	Never n(%)	Statistical significance (Fisher's exact)
Hospital departments	86 (54.4)	45 (28.5)	8 (5.1)	16 (10.1)	3 (1.9)	p<0.001
Ambulatory care	14 (33.3)	8 (19.1)	6 (14.3)	9 (21.4)	5 (11.9)	
Departments in hospital						
Surgical	56 (62.9)	22 (24.7)	3 (3.4)	5 (5.6)	3 (3.4)	p=0.021
Nonsurgical	30 (43.5)	23 (33.3)	5 (7.3)	11 (15.9)	0 (0.0)	

* p – statistical significance; PIM – potentially infectious material

Table 3. Frequency of NSIs among study group (n=200,%)

Variables	Frequency of NSIs				Statistical significance
	At least several times a month n(%)	Several times a year n(%)	Fewer than several times a year n(%)	Never n(%)	Chi² and Fisher's exact
Seniority (years)					
<5	3 (7.9)	3 (7.9)	12 (31.6)	20(52.6)	p<0.001
6-15	15 (20.2)	8 (10.8)	38 (51.4)	13 (17.6)	
16-25	4 (6.1)	15 (23.1)	39 (60)	7 (10.8)	
>25	2 (8.7)	2 (8.7)	18 (78.3)	1 (4.3)	
Workplace					
Hospital	17 (10.8)	23 (14.6)	92 (58.2)	26 (16.4)	p<0.017
Ambulatory care	7 (16.7)	5 (11.9)	15 (35.7)	15 (35.7)	
Departments in hospital					
Surgical	9 (10.1)	11 (12.4)	56 (62.9)	13 (14.6)	NS p=0.58
Nonsurgical	8 (11.6)	12 (17.4)	36 (52.2)	13 (18.8)	

* Chi² – Chi-squared test; Fisher – Fisher's exact test; p – statistical significance; NS – not significant; NSIs – needlestick and sharp injuries.

Table 4. Frequency of superficial and deep injuries** among study group during the year preceding the study (n=200, %)

Variables	Frequency of superficial injuries				Statistical significance	Frequency of deep injuries				Statistical significance
	No n(%)	Once n(%)	Several times n(%)	More than several times n(%)	Chi² and Fisher's exact	No n(%)	Once n(%)	Several times n(%)	More than several times n(%)	Chi² and Fisher's exact
Workplace										
Hospital	22 (52.4)	15 (35.7)	3 (7.1)	2 (4.8)	NS p=0.3	89 (56.3)	38 (24.1)	30 (19.0)	1 (0.6)	NS p=0.3
Ambulatory care	62 (39.2)	67 (42.4)	24 (15.2)	5 (3.2)		27 (64.3)	10 (23.8)	4 (9.5)	1 (2.4)	
Departments in hospital										
surgical	33 (37.1)	38 (42.7)	16 (17.9)	2 (2.3)	NS p=0.6	51 (57.3)	23 (25.9)	14 (15.7)	1 (1.1)	NS p=0.5
nonsurgical	29 (42.0)	29 (42.0)	8 (11.6)	3 (4.4)		38 (55.1)	15 (21.7)	16 (23.2)	0 (0.0)	
Work seniority (years)										
<5	26 (68.4)	9 (23.7)	3 (7.9)	0 (0.0)	p=0.03	28 (73.7)	6 (15.8)	4 (10.5)	0 (0.0)	NS p=0.2
6–15	28 (37.8)	33 (44.6)	10 (13.5)	3 (4.1)		42 (56.8)	21 (28.4)	9 (12.1)	2 (2.7)	
16–25	24 (36.9)	26 (40.0)	12 (18.5)	3 (4.6)		34 (52.3)	14 (21.5)	17 (26.2)	0 (0.0)	
>25	6 (26.1)	14 (60.9)	2 (8.7)	1 (4.3)		12 (52.2)	7 (30.4)	4 (17.4)	0 (0.0)	

* Chi² – Chi-squared test; Fisher – Fisher's exact test; p – statistical significance;
** Superficial wounds affect only the epidermis. Deep injuries can affect tendons, muscles, ligaments, nerves, blood vessels, or bone;
NS – not significant.

training more frequently reported NSIs (Chi²=29.14; p<0.001). Participation in post-exposure training had no effect on NSIs reporting (Chi²=12.66; p=0.12), although the training duration did. Nurses who had participated in such training within the last year were more likely to have reported acute incidents (Chi²=22.74; p=0.03).

Post-exposure prophylaxis. Post-exposure prophylaxis was implemented in one in four nurses (n=41; 25.79%) among those who had injured themselves during the 12 months preceding the study. First, an interview was conducted and the risk of possible infection assessed; blood tests were performed. Among the nurses who received prophylaxis, the blood test revealed HIV in 27 cases, and anti-retroviral treatment in eight cases.

On the other hand, the main reasons for not implementing post-exposure prophylaxis were:
- inability to leave the workplace ('there was no one to replace me') (n=32; 24%);
- 'post-exposure procedure is very burdensome and long-lasting' (n=30, 22%);
- 'the hospital deciding on the implementation of the anti-retroviral procedure is far from my work' (n=23; 17%);
- 'I hurt myself many times and nothing bad happened' (n=16, 12%);
- 'fear of side-effects of anti-etroviral therapy'(n=13; 10%);
- a bad example of a supervisor who 'also hurt themselves and do not implement the post-exposure procedure' (n=11; 8%);
- 'colleagues also do not report injuries' (n=9; 7%);
- 'I regularly test myself for HIV and HCV at my own expense' (n=1; 1%);

More than half of the nurses stated that they had encountered refusal to implement the post-exposure procedure during their professional career (n=85, 53.8%).

Table 5. Structure of NSIs and circumstances which, according to the nurses, contributed to the last remembered injury (n=159)

	No. of cases (%)
Which part of the body was injured?	
finger	85 (53.46)
hand	59 (37.11)
forearm	15 (9.39)
What type of tool caused the injury?	
injection needle	67 (42.14)
surgical needle	34 (21.38)
scalpel	29 (18.24)
cannula	29 (18.24)
Activity during which the injury occurred	
blood sampling	57 (35.85)
surgical procedures	38 (23.9)
venipuncture	32 (20.13)
injections	9 (5.66)
central venipuncture	3 (1.89)
cleaning	15 (9.43)
recapping	5 (3.14)
Circumstances which contributed to NSIs *	
unpredictable patient behavior	55 (34.59)
workload	28 (17.61)
emergency	27 (16.98)
hurry, rush	26 (16.35)
inadvertency	26 (16.35)
hard to say	19 (11.95)
attempting to put the needle cover on	12 (7.55)
no team cooperation	10 (6.29)
poor conditions at work	9 (5.66)

* nurses could choose more than one answer

Availability of safety devices. The entire study group was asked about the availability of safety devices in the workplace. Most of the surveyed nurses confirmed such availability (n=177; 88.5%). Variables, such as the workplace, i.e. hospital – ambulatory care, specificity of the department and location of the workplace, did not show a significant relationship with the nursing staff access to safety devices.

Every fourth nurse stated that she did not willingly use safety devices (n=53; 26.6%), and every fifth (n=41; 20.6%) that she did, but whenever possible they chose traditional medical tools. The answers did not depend on seniority, place of work (hospital – ambulatory care) and the specificity of the department. However, training did influence the use of safety equipment. Nurses who confirmed that training in the use of safety devices took place at work were more likely to use the devices and more often answered that 'such devices are comfortable and guarantee our safety' (Chi^2=87.39; p<0.001; Fisher's exact test p<0.001).

Data analysis also indicated a statistically significant relationship between superficial and deep injuries experienced in the year preceding the study, and the nurses› opinions on safe devices. Fisher's exact test showed that the groups with different opinions on safety devices used sustained NSIs at different frequencies (Tab. 6). In addition, 113 nurses (56.5%) stated that the staff had little influence on the type of medical sharp instruments delivered – management did not control the quality of the safety devices purchased, nor did it take into account the opinion of the staff about the equipment; the cheapest equipment was purchased. At the same time, a smaller group of respondents (n=87; 43.5%) confirmed that the management evaluated the opinions of nurses about safety devices.

DISCUSSION

The current study determined NSIs frequency and clarified the structure of sharps injuries. A high rate of non-reporting NSIs was recorded at 42%. Most nurses confirmed the easy availability of safety devices, but not all nurses wanted to use them. The study confirmed that training had an impact on NSI reporting and the use of safety devices.

It is estimated that three million healthcare workers worldwide experience injuries from needles and sharp instruments each year [2]. Studies by many authors indicated that nurses are an occupational group most often affected by needlesticks and injuries [14–16]. In Poland, there are about 37,000 such cases annually. The most frequent contact with body fluids was experienced by the staff working in hospitals, in particular, in surgical departments. Similar results were obtained in many hospitals worldwide [17–19]. Majority of injuries – needlestick and cannula injuries – occur during intravenous procedures [14], with the most common injuries being caused by injection needle, surgical needle, scalpel and cannula. Activities during which the injury occurred were mainly blood sampling, surgical procedures, venipuncture and injections. In addition, almost one in ten nurses was injured while cleaning sharp instruments, and several were injured while recapping needles. Similar results were obtained by Aydin et al. in their study of a group of hospital staff who including doctors, nurses, technicians, trainees and cleaning staff. The study showed that 68.2% had experienced

Table 6. Frequency of NSIs in the year preceding the study and the nurses' opinions on safety devices

Variables	Frequency of superficial injuries**			Statistical significance	Frequency of deep injuries**			Statistical significance
Answers to the question „Do you use safety devices at work?"	No n(%)	Once n(%)	At least several times n(%)	Chi^2	No n(%)	Once n(%)	At least several times n(%)	Chi^2
Yes, it is very comfortable and guarantees my safety	32 (56.1)	17 (29.8)	8 (14.1)	p<0.001	36 (63.2)	13 (22.8)	8 (14.0)	p<0.001
Yes, I have no choice but I don›t like using them	10 (20.8)	31 (64.6)	7 (14.6)		25 (52.1)	11 (22.9)	12 (25.0)	
Yes, but if I can, I choose non-safety devices	19 (46.4)	13 (31.7)	9 (21.9)		26 (63.4)	8 (19.5)	7 (17.1)	
No, I do not use them	22 (41.5)	21 (39.6)	10 (18.9)		28 (52.8)	16 (30.2)	9 (17.0)	

* Chi^2 – Chi-squared test; Fisher – Fisher's exact test; p – statistical significance;
** Superficial wounds affect only the epidermis. Deep injuries can affect tendons, muscles, ligaments, nerves, blood vessels, or bone.

a needlestick injury and 9.1% had been injured by other sharp instruments [17]. Analysis of data collected in Japan showed that surgical needles were responsible for 54.9% of needlestick injuries among doctors and 31.5% among nurses [19]. The structure of injuries is similar in different studies.

It is still worrying that there remain injuries that can be avoided by following procedures, such as not recapping, and several studies have shown a reduction in injury rates through recapping after training. Therefore, training to remind staff of currently applicable procedures should be held. It would be best if the trainings were not only theoretical lectures, but also practical to demonstrate the correct way to use instruments, how to remove them safely, and finally, the appropriate behaviours/reactions in emergency situations – e.g. the unpredictable behaviour of a patient. Nurses indicated this as the most common cause of injury.

The current study shows that, for various reasons, 42% of the surveyed nurses did not report a case of injury to anyone. This is very disturbing information. The reporting of exposure is important not only from the point of view of statistics, but above all because of the need to take appropriate steps with regard to the prevention of infections and diseases. Other studies have also shown a high percentage of non-reporting of occupational exposure [18, 20]. In a study conducted in the USA, it was estimated that approximately half of exposures remain unreported, which is a result similar to that obtained in the current study. [18]. In the research by Jończyk et al., the respondents who did not report exposure gave as the reasons to do so: belief in non-infectiousness of the patient, lack of time, feeling of no obligation to report exposure, fear of upcoming tests, and too much inconvenience related to the notification [21]. The reasons for not reporting have remained the same for years. Similar reasons were also indicated by the nurses in the current study, which demonstrates the need for education and programmes raising awareness of the need to report sharps injuries.

The presented study found that training affected the reporting rate of NSIs. It was indicated that education can produce improvements in reducing NSIs and improving behaviours, although in the short term [22]. It is therefore important that educational trainings take place frequently, for example, every year.

The study also showed that the majority of surveyed nurses confirmed the availability of safe equipment in the workplace; however, every fourth nurse stated that she did not willingly use the devices. More than half of the nurses declared that the staff had little influence on the type of medical instruments provided, and that the nurses had no choice regarding equipment or did not use safety devices, were more likely to experience superficial NSIs. A German study showed a decrease in the frequency of needle stick injuries after the introduction of equipment containing solutions to protect against injuries [10]. Similar results were obtained in an Australian study [12] in which after the introduction of safe solutions, the frequency of exposure decreased [11,18,23–24]. Again, the need for education is a very important conclusion. The current study shows that some nurses were reluctant to use safety devices, and that satisfaction increased with training on how to use the equipment.

In Poland and throughout the European Union, regulations have been in force for many years which obligate management to ensure the safe contact of employees with sharp tools [13]. However, there is a danger that due to financial restrictions, equipment purchased will tend to be the cheapest and, at the same time, will not meet medical staff expectations. This is confirmed in the current study in which nurses had no influence on what type of safe tools was purchased; that the equipment purchased was simply the cheapest, and managers did not evaluate opinions on the safety devices used. It should be noted that costs associated with the provision of medical equipment designed to improve medical personnel safety may be offset by savings resulting from less frequent exposures and reduced costs [25].

It should also be emphasized that ensuring the safety of personnel working in a healthcare environment can be a challenge and requires a multidimensional approach to reduce occupational exposure to blood-borne pathogens. The implementation of a system of continuous supervision over the occurrence of occupational exposures in order to identify the most common causes of exposure and tools that most often cause them, remains very important. Only intensified educational and preventive activities and taking appropriate actions in the event of occupational exposure can reduce the risk of infection among hospital staff.

Limitations of the study. The results were based on a questionnaire survey conducted via the Internet, which was due to the restrictions enforced by the COVID-19 pandemic, and excluded random selection of the participants. The selected respondents were matched according to social groups, which ruled out analysis on the representative group; for example, the oldest age group included 23 people. This was probably due to the fact that the questionnaire was available Online and that older people use social networking sites less often. Because of the pandemic, there was no other way to reach the study group. Nevertheless, the study provides valuable information on the frequency and structure of injuries and the use of safety devices, as well as the importance of staff training.

Recommendations. Decisive action should be taken to increase the reporting of NSIs which can be achieved through systematic training that will also assist in increasing knowledge of the necessary infection prevention. Providing good quality equipment acceptable to the nurses, as well as training in how to use it, should increase the willingness to use safe equipment. Below are recommendations resulting from the study:

- implementation of measures to increase NSIs reporting;
- raising of awareness of post-exposure prophylaxis;
- increasing availability of good quality safety devices, taking into account nurses' opinions.

CONCLUSIONS

1. Nurses are exposed to sharps injuries in the workplace. In this study, only 16.4% of nurses in hospitals and 35.7% of nurses in ambulatory care had never been injured by a sharps instrument. Nurses most often injured a finger with an injection needle while drawing blood.
2. The most frequently reported cause of injury was unpredictable patient behaviour.
3. Almost a half of nurses (42%) did not report their injury.
4. The vast majority of nurses (88.5%) confirmed access to safety devices, but not all used them. In addition, a rela-

tionship was noted between the injuries sustained and the opinions of nurses about their use of safe devices.

5. Training should be systematically repeated. Nurses who participated in occupational infection prevention training more frequently reported NSIs. Nurses who participated in post-exposure training within the last year were more likely to report NSIs. In addition, training in safe equipment increases the willingness to use it.

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