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Special Issue: Nursing and Healthcare: Current Scenario and Future Development

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2016, 5, 7S:189-194

Effect of the use of a safety intravenous catheters to prevent needle stick injuries

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ABSTRACT

The damage caused by sharp objects is one of the most important biological hazards among health care workers. Due to the importance of occupational injury, this study aimed to investigate the efficiency of using safety intravenous catheters with the safety Chamber features in reducing the damage caused by the needle during veni puncture in Afzali pour hospital wards in Kerman. This was a Quasi-experimental study. The sample was consisted of all nurses who worked at Kerman Afzali pour Training hospital during the course of the study.After training was provided to the staff, the available intravenous catheters were distributed among them by hospital medical equipment units. The data were gathered six months before and after the use of safety intravenous catheters, and were analyzed by using SPSS and descriptive statistics tests.The average age at the time of NSI (4.7 ±) was 30. People who were in the range of 25-29years oldhad40%injuries.There was a significant correlation between the NSI in the second half of2011 and first half of2012before and after the use of safety angicuts. (p<0.001)Considering the results, the use of safety needles is recommended to reduce injury.

Keywords: Needle-stick, Safety intravenous catheters, Nurses
Word count: 2428

INTRODUCTION

One of the most important biological hazards threatening the lives of healthcare workers is the damage caused by sharp objects such as intravenous (IV) catheters contaminated with blood and body fluids. Such a damage in health care sectors could transmit more than 20 types of blood-borne pathogens (Blood Borne Disease) to employees,[2] in which the transmission of hepatitis B and C, and the emergence of new diseases such as HIV are the common biological consequences of these damages,[1, 3] that the probability of transmission of pathogens are 30%, 3%, 3.0%,respectively,[4-5] This may cause chronic illnesses or death in patients,[6] The World Health Organization (2002) reported that2.5%of health workers around the world are infected by HIV, and about 40% of the suffer from HBV and HCV due to occupational damages,[7] 80% to90% of such infections are transmitted to health care workers by needle injury,[8] According to Bilski (2006) and Mand ell et al. (2005), one of the most important ways a dangerous infection pathogen can enter a body is through needle injection during vein puncture,[9-10] Despite various at tempts in recent years to reduce and prevent injuries resulting from the injection of needles, the injuries are still prevalent in health care sectors due to the lack of safety observations,[11].

Prospective studies have shown that the true prevalence of needle injury is higher than what is reported in retrospective studies and the rate of damage during a year varies from14 to839per1,000employees,[12] Despite the advances in technology and increasing awareness of health staff,600thousandtoonemillionhealthworkersare

damaged by sharp objects and needle sensually,[13]It is estimated that sharp instruments are the cause of one million injuries in USA,[14]Also 5901996injuries causedby sharp instruments were reported in England annually,[15]Recent studies indicate that the extent of damage caused by sharp instruments in health workers in developing countries is more than developed countries,[16] In Iran, the exact number of occupational injuries of the medical staff is not available, but according to a study done by Baba Mahmoudi(1996) in Mazandaran, 57.7% of medical staff have contact with needle,[17]and according to Asgariyan et al.(2005),44% of the damage in health care workers is caused by needles,[18]Afrasyabifar et al. studied the damage caused by sharp objects contaminated with blood and body fluids of patients in Yasooj hospitals showed that vein puncture (26.4%)and bloodletting (20.8%) are the most frequent activities the staff injured by needle-stick[19]Khaloei et al. found that vein puncture with the frequency of3 | 28is the most common accident in needle injuries,[20] The studies suggest that most nurses experience injuries caused by sharp instruments,[20-21] And that 80% of such injuries could be prevented through observing safety regulations. They can even be prevented to90% with proper training and instructions,[22]Generally speaking, injections (especially veni puncture) are the most risky treatments due to the widespread use of syringes and needle by the major it of employment in all sectors. According to Canada Epidemiology Committee and Abu et al. (2001) injections and vein puncture are the most damaging medical procedures,[23-24] Many non-Iranian studies have investigated the prevalence and incidence of needle-stick. In Iran, most of the studies have been devoted to the investigation of the rate of needle-stick injury prevalence,[25-26] and the emergence of this phenomenon,[27] As far as we know, no study has still been done on the impact of new tools such as the use of safety IV catheters on reducing occupational injuries in hospital staff including doctors and nurses. Also, as we mentioned before, due to the involvement of nurses in giving medical services to patients, they are commonly exposed to the risk of injury by needles and sharp instruments. These damages can be reduced by using safety IV catheters. Due to the importance of occupational injuries, we decided to investigate the efficiency of using safety intravenous catheters with the safety Chamber features to reduce the damage caused by needles during venin puncture in Afzali pour hospital emergency wards in Kerman. We hope we can take an important step in reducing the problem of occupational injuries among medical workers.

MATERIALS AND METHODS

Design

The study employed a one-group pretest-posttest design.

Sample and setting

The study sample comprised all of nurses from Afzali pour hospital. The hospital is a general hospital with 364 active beds and is under the supervision of Kerman University of Medical Sciences Afzali pour hospital is in a region known as Kerman in the center of Kerman province and provides medical services for all parts of the province. The data collected from all of nurses in wards including:

Internal, Pediatric surgery, Gynecological Surgery, General Surgery, ICU of children, Emergency, CCU of adults, CCU, POST CCU, ICU, NICU, Pediatric oncology, Dermatology, Infectious diseases, Thoracic Surgery, Gastroenterology, kidney transplant, Bone marrow transplantation, liver transplant, Endocrinology, NICU, ICU of surgery, lung

Interventions

Instruments

Safety IV catheters are chosen since conventional IV catheters used in many hospitals lack the following features:

1. Having safety chamber for the prevention of AIDS and hepatitis B with Needle Stick
2. Having a port with flip open door to facilitate and speed up the injection
3. Having asiliconize drain to prevent allergic
4. Having radio opaque line in order to see in radiographs
5. Having retry able drain in order to increase the capacity of frequent vein puncture
6. Having luer lock connect or in order to increase the safety in connection

Ethical consideration

Because this study involved human subjects, prior to the collection of any data, project approval was obtained from both Kerman University of Medical Sciences and the head of Afzali pour hospital. The study proposal also was reviewed and approved by center's office of Research Ethics in Kerman University of Medical Sciences (ethic code: K/91/218). The written informed consent forms were signed by nurses. The consent form explained that participation was completely voluntary, and they can withdraw from the study at any time. After nurses informed about the purpose of study and procedure, both verbally and with written information, all of nurses participated in this study voluntarily.

Study procedure
Prior to distribution of safety IV catheters, a workshop conducted by educational supervisor of the hospital. This workshop consisted of a one-hour interactive PowerPoint presentation in subjects of the prevalence, causes, consequences and prevention of needle Stick Injury (NSI).

Also to insure that nurses were able to properly use the IV catheters educational supervisor trained the nurses face to face and in wards. Each workshop was performed by two trainers: one person guided the process and one person, experienced in working with different types of hospital needles, actively involved all participants. One trainer wrote a short report of the interactive discussion during the workshop. Workshops were carried with the prior notice in meeting room at the morning and afternoon shifts. At each ward, the workshop was offered four times between April and August 2014. Education was compulsory for all employees. Feedback on awareness and attitude to risks, best practices and possible improvement with respect to the prevention of NSI was given to the head nurse of every ward by means of a short leaflet after finishing all workshops. After training the staff on how to use IV catheters, the IV catheters were distributed in hospital wards.

The information related to needle-stick injuries in two six-month periods before and after the use of safety IV catheters (Second half of 2014 and the first six months of 2015) was gathered from the hospital's nursing office. The information related to nurses who experience NSI included their age, gender, nursing experience and the shift that they experienced NIS.

Data analysis
Data from the questionnaires were analyzed using the Statistical Package for Social Scientists (SPSS 20). Descriptive statistics were computed for the study variables. To examine the effect of using safety IVC on rate of NSIs McNamara Test was used.

RESULTS

Participants
A descriptive analysis of the background information (Table 1) revealed that the participants belonged to the age group of 20-40 years with a mean age of 33 years and were mainly female (92.8%). The majority had a Bachelor of Science degree in nursing (79.76%) with 6-10 years' experience of working in hospitals (70.5%).

Descriptive findings
From all of the patients in the two six-month periods (the second half of 2014 and first six months of 2015), 11 and 2 patients suffered from NSI respectively. Table 2shows the demographic characteristics of the nurses in second half of 2014 and the first six months of 2015 are shown. The average age at the time of the NSI was 27.33 years old, the youngest person in the NSI was 23 and the oldest was 36. The 25-29 year old group was 46.15% damaged. From the 13 cases of NSI, 5 cases occurred in the morning shift (38.46%), 3 cases in the evening shift (23.07%), and 5 cases at night shift (38.46%) with $\leq$5 years' experience of working in hospitals (46.15%). Generally, the most frequent cases of NSI in the two six-month periods were in the Emergency Department Staff (46.15 %) (Table 2).

Correlations
Another result of the study was 81.2 reduction in the cases of NSI in the two six-month periods before and after using IVC safety with safety chamber features ($p<0.001$) (see Table 3).

DISCUSSION

Despite the significant progress happened in the field of medicine, needle stick injuries are still a major threat to healthcare workers especially nurses who are more often exposed to blood borne pathogen and other blood injury factors.

Since Afzali pour Hospital has a policy of infectious disease transmission prevention, and it necessitates the observation of safety regulations such as hand washing after contact with patients, personal protective equipment (such as gloves), the collection and safe disposal of contaminated needles in especial closed containers. The hospital's major goal is to to reduce the incidence in jury .Therefore, the head of the hospital are mindful to enhance the safety options by using safer vein puncture instruments which is another important step toward the prevention of infection and injury caused by needle stick.

According to the results of the present study, 15 cases of NSI during vein puncture happened in 12 months. In reviewing the literature, we found that Khaloei et al. (2009), Bilski (2005), and Mandell et al. (2005) showed that

vein puncture is the most common host of needle damage. The cause of the high prevalence of this problem is recapping of needlesafter by employees. As a remedy, the use of needle cutter and safety disposal box in the clinical sectors has been on the rise in recent years.

Another result of the study showed a 63.63% reduction of NSI among the nurses and also a significant difference in the rate of needle stick in jury in the two six-month periods before and after using the safety angiocath with the safety chamber characteristic ($p<0.001$). These resultsare consistent with the findings of Yassi et al. (1995) and Hoekstera et al. (2011).They showed that the use of syringes and new secure needles reduced injuries, significantly. Also, Mendelson et al. (1999, 2000) showed that the use of new catheters, new stitch needle and new blood equipment decreased the injuries approximately 76% in some cases It can be said that a dramatic reduction in the incidence of needle stick injuries is due to the safety chamber features in angiocath, which after vein puncture and pressing the button on the angiocath, needle is Putin the container and placed at the end of it. As a result, it prevented personnel from direct contact with needles.

One of the findings of the research was that the most important risk factor for injury caused by needle was working at night and morning shifts (42.85%) compared with the evening shift, which is similar to the studies of Khaloei et al. (2007), Lotfi and Gashtasbi (2006), and Johnson et al. (2005). It is because of work pressure the high number of patients and medical tests in the morning shift, fatigue, drowsiness and stress of the nurses at night shifts.

One of the results is the impact of personnel's' work experience on the needle stick injury. The injury rate was higher in those who had less work experience, and that are in accordance with the research results of Ilhan et al. (2006), and Dement et al. (2004). Consequently, the training can be considered as a way to reduce injuries.

Another outcome of the study was that most of the damage was in the emergency department (54.54%), ICU (27.27%), infectious department (9.09%), and respiratory ward (9.09%) respectively. The incidence of injuries in the emergency and ICU ward was similar to the findings of Khaloei et al. (2009) and Ilhan et al. (2006), which can probably be because the urgency of doing things and dealing with emergency cases compared to other sectors.. So, in the cases of emergencies, safety is as important as providing urgent services.

Another result of this study was that the majority of injuries occurred between the ages of 25 and 34. This is in agreement with the research findings of Nouhi et al. (2010) and Abdi et al. (2008). Perhaps the leading cause of injury in this age group is due to their youth, inexperience, snap, or lack of adequate skills in performing procedures.

Limitations

With regard to the determination of the type of damage report, it seems that many employees did not report their injuries. This may be due to the lack of effect of injury report on the treatment of diseases, lack of awareness, patient's perception of not having any communicable diseases, history of uncomplicated injury, fear, being secure against hepatitis b, overwork and lack of a well-ordered system (especially the injury report form) in order to report injury and follow up and support for injured people by officials. Hence, the nurses should be trained in order to avoid their personal judgment of the risk of infectious diseases transmitted through blood, and they should report the damage.

Table1.Background characteristics of sample

Variable	n	%
Age(years)		
20-25	6	1.7
26-30	219	63.3
31-35	118	34.1
36-40	3	0.9
Gender		
Male	25	7.2
Female	321	92.8
Education		
Diploma	**58**	**16.76**
Bachelor science	**276**	**79.76**
Master science	**12**	**3.48**
Years of nursing experience		
1-5	71	20.5
6-10	244	70.5
11-15	31	9.0

Table 2.Background characteristics of nurses who had needle stick injuries

Variables	The second half of 2014 (before using the safety IVC)		The first six months of 2015 (after using the safety IVC)	
Gender	frequency	Percentage	frequency	percentage
Male	4	36.36	1	50
Female	7	63.63	1	50
Age				
20-24	0	0	1	50
25-29	5	45.45	1	50
30-34	4	36.36	0	0
≥34	2	18.18	0	0
Shift				
Morning	4	36.36	1	50
Evening	3	27.27	0	0
Night	4	36.36	1	50
Years of nursing experience				
≤5	5	45.45	1	50
5-10	6	54.54	1	50
10-15	0	0	0	0
15≤	0	0	0	0
Ward				
Emergency	5	45.45	1	50
ICU	2	18.18	1	50
Infectious	2	18.18	0	0
Respiratory	2	18.18	0	0

Table 3. Effect of the use of a safety intravenous on rate of needle stick injuries

Ward	Nurses who had NSI before using the safety IVC N (%)	Nurses who had NSI after using the safety IVC N (%)
	11 (3.17)	2 (0.58)
McNemar Test	p-value=0.02	

CONCLUSION

Given the high rate of NSI, besides taking measures, holding training courses for with safe design would be effective. Experts also believe that nurses should be careful with recapping needles after using them. With regard to the findings of this research, the use of safety needle is recommended to reduce damage. Therefore, although the stati care twice more than the cost of conventional Angiocaths, they greatly reduce the risk of transmission of infectious diseases. Thus use of them is more affordable and they are used in different wards of a hospital. Hence, the use of safer instruments for vein puncture inpatients is another step toward the prevention of the transmission of infection caused by NSI.

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