Healthcare Personnel Opinion and their Implementation Obstacles Regarding the Standard Precautions in Hemodialysis Unit

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Received August 1, 2019, accepted September 1, 2019.
doi: 10.47104/ebnrojs3.v1i4.105

ABSTRACT

***Context*:** Hemodialysis HD patients, as well as the dialysis staff, are vulnerable to contracting health-care-associated infections (HAIs) due to frequent and prolonged exposure to many possible contaminants in the dialysis environment.
***Aim*:** Assess healthcare personnel HCP opinion and their implementation obstacles regarding standard precautions (SPs) in the hemodialysis unit.
Methods: The study conducted at the hemodialysis unit at Al Mouwasat University Hospital, Alexandria, Egypt. A descriptive research design was used to collect data for this study. All healthcare personnel working in the setting mentioned above were included. Two tools were used. The first tool is a standard precautions practices in hemodialysis observational checklist: The second tool is a structured interview questionnaire to assess the opinion of healthcare personnel regarding the applicability of standard precautions in the hemodialysis unit and their implementation obstacles.
***Results*:** The standard precautions practice score showed unsatisfactory practice among HCP. Regarding their opinion, the majority of HCP disagreed to follow the five moments and reported that the WHO technique of hand hygiene is so sophisticated and time-consuming; they disagreed with changing gloves between patients and considering gloves as a substitute to hand hygiene. The majority recap the needle by two hand techniques disagreed with following respiratory hygiene, and color-coding was accepted only from nurses. Also, it was found that there was a positive correlation between years of experience, infection control training programs, and the level of SPs practice score.
Conclusion: Unsatisfactory SPs practices showed a high percentage of HCP. Healthcare personnel tends to agree to certain infection control practices over other practices. Availability and accessibility of equipment and supplies that interfere with the application of SPs practices and lack of knowledge concerning infection prevention and control were considered as implementation obstacles of SPs practices. Education and training of HCP on SPs, together with consistent and robust management support, are recommended. In addition to the development of national precautions after conducting researches that confirm its effectiveness.

***Keywords*:** Standard Precautions, opinion and implementation obstacles, hemodialysis

1. Introduction

Infection is the most common cause of hospitalization, and the second most common cause of mortality among hemodialysis (HD) patients after cardiovascular disease *(Karkar, 2018).* Patients who undergo dialysis treatment have an increased risk of getting an infection. In hemodialysis units, blood-borne viruses (BBVs) are an infectious hazard. The main viruses are Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immune Deficiency Virus (HIV). Similarly, patients with central line-catheters area at higher risk of Central Line-Associated Blood Stream Infections (CLBSI) than those with a fistula or graft. Moreover, these patients are also at risk for influenza infection *(Garthwaite et al., 2019; Miskulin, 2019).*

Hemodialysis patients (HD), as well as the dialysis staff, are vulnerable to contracting health-care-associated infections (HAIs) due to frequent and prolonged exposure to many possible contaminants in the dialysis environment. The major predisposing factors are the extracorporeal nature of the therapy, the associated common environmental conditions, and the immune-compromised status of HD patients. The evident increased potential for transmission of infections in the HD settings led to the creation and implementation of specific and stricter infection prevention and control measures in addition to the usual standard *(Karkar, Bouhaha, & Dammang, 2014).*

The infection control practices in the form of standard precautions are recommended for hemodialysis units in order to reduce the opportunities for patient-to-patient transmission of infectious agents, directly or indirectly via contaminated devices, equipment, and supplies, environmental surfaces, or hands of personnel *(Centers for Disease Control and Prevention, 2017).*

Many studies recommended that; standard precautions with additional measures specifically for dialysis centers will prevent transmission of infection from patient to patient and maintain safety for healthcare staff. Standard

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precautions are required to monitor the effectiveness of infection control practices, as well as training and education of both staff members, and patients are essential to ensure that appropriate infection control behaviors and techniques are carried out. These precautions include hand hygiene, routine use of personal protective equipment (PPE), environmental cleaning, waste management, dealing with splashes, dealing with sharp instruments, linen management, occupational safety, and respiratory hygiene/cough etiquette. In addition to surveillance and preventing the transmission of HBV and influenza, infections require vaccination of susceptible patients and staff *(Khamis, Yasin, Omara, & Saleh, 2018; Abou El-Enein & El Mahdy, 2011).*

Healthcare-associated infections (HAIs) are thought to be mostly avoidable through adherence to standard precautions. Compliance of health-care workers with SPs has been recognized as being an efficient means to prevent and control health-care-associated infections protect not only the patient but also the health-care workers and the environment *(Akagbo, Nortey, & Ackumey, 2017)*. It is vital for nurses, physicians, dialysis technicians, and all healthcare personnel to understand and follow standard precautions. Furthermore, education and training of frontline personnel is the key to ensuring compliance and successful implementation of those practices *(Travers et al., 2015).*

Reasons for a successful or unsuccessful implementation of standard precautions (SPs) are often multiple and interconnected *(Birgand, Johansson, Szilagyi, & Lucet, 2015)*. According to the literature, major reported factors that affect compliance with standard precautions include but not limited to lack of understanding and knowledge among healthcare workers on SPs. Also, shortage of time to implement the precautions (work overload), limited resources, lack of proper training, uncomfortable equipment, skin irritation, forgetfulness, distance from the necessary facilities, and insufficient support from management in creating a facilitating work environment *(Fayaz et al., 2014; Efstathiou, Papastavrou, Raftopoulos, & Merkouris, 2011).*

2. Significance of the study

Unfortunately, numerous reports in the medical literature showed that adherence to infection control policies is often suboptimal. Most of the data documenting suboptimal adherence originate from high-volume centers in developed nations *(Cawich et al., 2013).* Implementing standard precautions (SPs) has been a significant challenge for healthcare workers (HCWs), especially those in developing countries, thereby compromising their safety and increasing their exposure to blood-related pathogens *(Akagbo et al., 2017).*

However, several Egyptian studies investigated compliance of nurses/healthcare workers to standards precautions in dialysis units. *Khamis Kora, El Barbary, and Gharib (2017)* at Qalyubia Governorate reported that there was a clear error in hand hygiene, personal protection, methods to prevent pollution, environmental cleansing, dealing with waste products, and vaccination. Moreover*, Abou El-Enein and El Mahdy's (2011)* findings revealed that none of the nurses washed hands before and after the different activities that required hand washing or used plastic aprons or face protection.

The international and national infection associations have established practices for hemodialysis, which are derived from the international infection control practice guidelines but has not yet determined the ability to implement these practices among the healthcare personnel. As nurses play a vital role in infection prevention and control, as well as maintaining the wellbeing of patients, this study was conducted to identify the healthcare personnel's opinion and their implementation obstacles regarding standard precautions in the hemodialysis unit at Al Mouwasat University Hospital in Alexandria, Egypt.

3. Aim of the study

- Identify healthcare personnel's opinion regarding the implementation of standard precautions in the hemodialysis unit.
- Identify the implementation obstacles of standard precautions in the hemodialysis unit from the Healthcare personnel (HCP) point of view.

3.1. Research questions

- What is the healthcare personnel opinion regarding the standard precautions in the hemodialysis unit?
- What are the healthcare personnel implementation obstacles regarding the standard precautions in the hemodialysis unit from their point of view?

4. Subjects & Methods

4.1. Research design

A descriptive research design was utilized to achieve the aim of this study. Selecting this design guided by *Fox and Bayat, (2007),* who explained that descriptive research is aimed at casting light on current issues or problems through a process of data collection that enables them to describe the situation more completely than was possible without employing this method.

4.2. Research setting

This study was conducted at the hemodialysis unit (HD), Al Mouwasat University Hospital, affiliated to Alexandria University, Egypt. The unit composed of two rooms that consisted of 10 dialysis machines (DM). There was a room assigned for patients with hepatitis B virus (3 DM) and one for patients with hepatitis C virus (15 DM). The unit worked in three shifts: 8AM -12 PM, 12 – 4:30 PM, & 4:30 – 10: 30 PM.

4.3. Subjects

The participants of this study comprised all healthcare personnel (35) working at the setting mentioned above, were available at the time of data collection and agreed to participate in the study. They were six physicians, 25

nurses, and four auxiliary personnel.

4.4. Tools of the study

Two tools were used in this study:

4.4.1. Standard Precautions Practices in Hemodialysis Observational Checklist

The researchers developed the tool after review of related current literature *(Hess & Bren, 2013; CDC, 2017; Saleh, Kavosi, et al., 2018; National Directory of Infection Control, 2017)*. This tool aimed to observe the performance of Standard Precautions practices of healthcare personnel in the hemodialysis unit as regards: hand hygiene, personal protective equipment (PPE), decontamination process, occupational safety, respiratory etiquette, linen management, and waste management. Besides, socio-demographic characteristics data including age, gender, marital status, years of experience, education level, and previous attendance of infection control training programs were attached.

Scoring system:

It has three response categories in the form of rating scale, including (Satisfactory: done correct and complete) scored 2, (Unsatisfactory: done correctly but incomplete) scored one and (not done/incorrect) scored 0. A total healthcare personnel score, as well as performance, were estimated as follows, more than or equal 75% represented a satisfactory practice. Less than 75% represented an unsatisfactory practice.

4.4.2. A structured interview questionnaire

This tool developed by the researchers after reviewing related literature *Abou El-Enein & El Mahdy (2011)*; *Akagbo et al., 2017; Lewis, 2019).* It aimed to identify the opinions of healthcare personnel (HCP) regarding the applicability of standard precautions in the hemodialysis dialysis unit and the implementation obstacles from their point of view. It consists of two parts:

Part one was concerned with the opinion of HCP. It covered the following practices:

- Hand hygiene: technique, frequency, indications, and precautions
- PPE: wearing a uniform, gloves (indications -technique), apron, and eye goggle.
- Following the decontamination process (indications – technique).
- Occupational safety/needlestick and sharps injury prevention: cover any wound in hands, needles recapping, dealing with sharp objects.
- Respiratory hygiene (etiquette): its basic principles.
- Waste management: color-coding, segregation.
- Staff vaccination
- Surveillance

Part two was concerned with the implementation obstacles. It comprised open-ended questions to identify the obstacles regarding their implementation of SPs concerning the eight items discussed in part one from their point of view. It is developed in the Arabic language.

4.5. Procedures

The approval of the Ethical Committee of Nursing Research at the Faculty of Nursing, Alexandria University, was obtained. Official permission to carry out the study was obtained from the responsible authorities Al Mouwasat University Hospital in Alexandria; after an explanation of the aim of the study.

Study tools were developed by the researchers based on reviewing relevant literature (CDC, 2017, and the Egyptian Ministry of Health infection control standards, 2017), and no modifications were made.

The tools were tested for content validity by seven experts (2 staff from infection control committees of the affiliated hospital; 2 nephrologists, Faculty of medicine; and three experts in medical-surgical nursing, Faculty of Nursing, Alexandria University).

The reliability of the tools I and tool II was assessed using test-retest reliability Cronbach alpha (Tool-1 α= 0.981, Tool- 2 α= 0.71).

A pilot study was carried out on five healthcare personnel after obtaining their oral approvals to assess the clarity and applicability of the tool and the feasibility of the research process. Modifications were introduced accordingly, and the pilot sample was later excluded from the main sample.

Every healthcare member was observed throughout the morning shift, using the first tool to assess her/his practices related to standard precautions in the hemodialysis process.

All healthcare personnel (physicians, nurses, and auxiliary personnel) working in the hemodialysis unit were interviewed individually once for 30-45 minutes, using tool II to collect data related to their opinions regarding the feasibility of standard precautions implementation on the hemodialysis dialysis unit and their implementation obstacles. Data were collected throughout four months, from the beginning of January, till the end of April 2018.

Ethical Considerations: Oral approval was obtained from the participants after explaining the aim of the study. Anonymity and privacy of the participants and confidentiality of the collected data were assured throughout the study. Healthcare personnel was also informed about their rights to withdraw from the study at any time. Witness consent from the head nurse was obtained.

4.6. Data analysis

SPSS package version 20 was used for statistical analysis. A descriptive statistical analysis for all study variables was conducted. Frequency and percentage were used for describing and summarizing qualitative data. Chi-square test (X^2) was used for comparison between the distribution of two qualitative variables. Monte Carlo and Fisher Exact tests were used for comparison between the distributions of two qualitative variables whenever the (X^2) test was not appropriate. The level of significance selected for this study was (p) equal to or less than 0.05.

5. Results

Table 1 displays the frequency and percentage distribution of the healthcare personnel in the hemodialysis unit according to their socio-demographic characteristics. (n= 35). The table shows that almost half of the nurses (48%) and a half (50%) of the auxiliary personnel were in the age group 20 to less than 30 years, while half (50%) of the physicians were between 30 to less than 40 years. Two thirds (64%) of nurses were females, two-thirds of physicians and all the auxiliary personnel were males (66.6%, 100% respectively). Regarding marital status, married showed the highest percentage among nurses, physicians, and auxiliary personnel (44%, 66.7%, 75%, respectively).

All the auxiliary personnel has less than one-year experience, half of the physicians (50%) have one to less than five years' experience, while the majority of nurses were distributed between one year to less than five and five years to less than 10 (36%, 32%). Almost half of the nurses (52%) have a secondary school nursing diploma. Half of the physicians have a master's degree, and half of the auxiliary personnel have primary/preparatory school. Regarding infection control training courses, the majority of nurses (80%), and two-thirds of physicians (66.7%) attend, while all the auxiliary personnel did attend any training courses.

Table 2 shows the frequency and percentage distribution of the healthcare personnel according to their practices of standard precautions in the hemodialysis unit. The table illustrates that almost two-thirds of both nurses and physicians showed the unsatisfactory practice of hand hygiene (60%, 66.7%, respectively), while the auxiliary personnel was equally distributed between unsatisfactory performance and not done. Less than half of nurses (44%) and half of both physicians and auxiliary personnel used PPE unsatisfactorily. Two-thirds of nurses (68%) practice the decontamination process unsatisfactorily, while two-thirds of physicians (66.7%) and all auxiliary personnel did not practice the decontamination process.

Regarding occupational safety practices, the majority of nurses (84%) practiced it unsatisfactorily, half of the physicians (50%), and all auxiliary personnel did not practice it. More than half of nurses (60%), half of the physicians, and all auxiliary personnel did not follow respiratory etiquette. Linen management was managed unsatisfactorily by (48%) of nurses. More than half of the nurses (52%) and one-quarter of auxiliary personnel (25%) followed waste management steps satisfactorily, while two-thirds of physicians (66.7%) did it unsatisfactorily, and 33.3% did not practice it.

Table 3 shows the frequency and percentage distribution of the healthcare personnel according to their opinion regarding the application of standard precautions in the hemodialysis unit. Standard precautions opinion covered eight items, which are hand hygiene, personal protective equipment (PPE), following decontamination process, occupational safety, respiratory etiquette, waste management, vaccination, and surveillance.

The table shows that the majority of nurses (80%) and half of the auxiliary personnel (AP) agreed to remove all jewelry beforehand hygiene, while two-thirds (66.7%) of the physicians did not. The majority of nurses, physicians, and AP disagreed with performing hand hygiene according to its type and its indications (88%, 83.3%, 75%, respectively). Also, the majority of nurses and all the physicians and AP disagreed to follow the five moments (92%, 100%, 100% respectively), and to follow the WHO technique of hand hygiene (88%, 100%, 100%, respectively). Wearing gloves as a substitute to hand hygiene was agreed by two-thirds of the physicians (66.7%) and all the AP, but only 28% of nurses agreed.

A regards PPE. The table explains that all nurses, the majority of physicians, and AP (100%, 83.3%, 75% respectively) agree that the uniform is mandatory in the clinical setting. Two-thirds of nurses, majority of physicians, and all the AP (64%, 83.3%, 100% respectively) disagreed with changing the gloves between patients. Moreover, the majority of nurses (72%), and half the AP disagreed with wearing gloves when hands come in contact with secretions or excretion, while all physicians agree to wear. The majority of nurses (72%), two-thirds of physicians (66.7%), and half the AP agreed to wear apron and face shield in procedures where blood splash is possible.

Regarding the decontamination process, disagreement shows the highest percentage among almost all items related, where the majority of nurses (84%), and two-thirds of physicians (66.7%) disagreed to follow surgical asepsis during insertion of the catheter. The same is also noted in occupational safety where disagreement overwhelmed the results, the majority of both nurses and physicians and all the AP (84%, 83.3%, 100% respectively) disagreed with avoiding two hands technique during needle recapping.

As regards respiratory etiquette, almost three quarters of nurses, all physicians and half of AP (72%, 100%, 50%) agree to cover nose/mouth with a tissue when coughing or sneezing. More than three-quarters of nurses, half of the physicians and all AP, disagree to use a mask when coughing (76%, 50%, 100%, respectively. Coughing or sneezing into the upper inner sleeve showed a high percentage of disagreement from nurses, physicians, and AP (84%, 100%, 100%, respectively).

Most of the nurses agreed on all waste management items, while almost all physicians and half of the AP have disagreed. The majority of nurses (80%) agreed that color coding for medical waste should be available, while the majority of both physicians and AP (83.3%, 75% respectively) did not agree. Staff vaccination shows the agreement of all studied subjects that all healthcare providers should be vaccinated with the hepatitis B and influenza vaccine. Concerning surveillance, the majority of nurses and physicians, and half the AP (72%, 83.3%, 50% respectively) agreed that they have to evaluate the risks and decide on infection control measures.

Table 4 presents the frequency and percentage distribution of the healthcare providers according to their implementation obstacles of standard precautions in the

hemodialysis unit. The table shows that the majority of nurses (88%) and all physicians and AP mentioned that the five moments are time-consuming and hand hygiene after touching the patient is enough, and all the studied subjects remarked that the WHO technique of hand hygiene is also time-consuming. The majority of nurses, two-thirds of physicians, and all AP (80%,66.7%,100% respectively) feel that gloves are hindering patient care, and (84%) of nurses and all physicians and AP mentioned that wearing gloves is enough and the other PPE is not necessary.

As regards decontamination process, all nurses and AP, two-thirds (66.7%) of physicians commented that cleaning and disinfecting steps could mix, shortage of staff interfered with following decontamination process as mentioned by the majority of nurses and physicians and all AP (80%, 83.3%, 100% respectively) and that (92%) of nurses and all AP lacked knowledge regarding decontamination process.

Regarding occupational safety, almost all the studied subjects considered that including sick healthcare providers in patient care is an obstacle, and the majority of nurses (96%) and all physicians and AP reported that heavy-duty gloves impeding work with the patients. The majority of nurses (88%, 76% respectively), half of the physicians, and all AP reported lack of knowledge regarding respiratory etiquette and inaccessibility of masks.

Both nurses and AP reported a lack of knowledge regarding staff vaccination (72%, 100%) and surveillance (88%, 100%). Moreover, work overload interferes with surveillance was reported by all nurses and AP, and half of the physicians. Skepticism about the value of hand hygiene, PPE, and respiratory etiquette showed a high percentage among both physicians and AP.

Table 5 illustrates the correlation between healthcare personnel's total practice scores and their socio-demographic data. This table illustrates that there was a significant correlation between the increase in years of experience, attendance of infection control training courses, and satisfactory practice ($p=0.016$, $p=<0.001$), respectively.

Table (1) Frequency and percentage distribution of the healthcare personnel in the hemodialysis unit according to their socio-demographic characteristics.

Socio-demographic Characteristics	Nurses (n = 25)		Physicians (n = 6)		Auxiliaries (n = 4)		Total (n = 35)	
	No.	%	No.	%	No.	%	No.	%
Age (years)								
20 to less than 30	12	48	2	33.3	2	50	16	45.7
30 to less than 40	10	40	3	50	1	25	14	40
Equal or more than 40	3	12	1	16.7	1	25	5	14.3
Gender								
Female	16	64	2	33.3	0	0	18	51.4
Male	9	36	4	66.7	4	100	17	48.6
Marital status								
Single	12	48	2	33.3	1	25	15	42.9
Married	11	44	4	66.7	3	75	18	51.4
Divorced	1	4	0	0	0	0	1	2.85
Widow	1	4	0	0	0	0	1	2.85
Years of experience								
Less than 1	3	12	0	0	4	100	7	20
1 to less than 5	9	36	3	50	0	0	12	34.3
5 to less than10	8	32	2	33.3	0	0	10	28.6
Equal or more than 10	5	20	1	16.7	0	0	6	17.1
Level of education								
Illiterate	0	0	0	0	1	25	1	2.8
Read and write	0	0	0	0	1	25	1	2.8
Primary/preparatory school	0	0	0	0	2	50	2	5.7
Secondary school Nursing diploma	13	52	0	0	0	0	13	37.2
Institute of technical nursing	10	40	0	0	0	0	10	28.7
B.Sc. nursing	2	8	0	0	0	0	2	5.7
B.Sc. medicine	0	0	2	33.3	0	0	2	5.7
Master medicine	0	0	3	50	0	0	3	8.6
Doctorate medicine	0	0	1	16.7	0	0	1	2.8
Infection control training courses attendance								
No	5	20	2	33.3	4	100	11	31.4
Yes	20	80	4	66.7	0	0	24	68.6

Table (2): Frequency and percentage distribution of the healthcare personnel according to their practices of standard precautions in the hemodialysis unit.

Standard precautions practices	Nurses (n = 25)						Physicians (n = 6)						Auxiliaries (n = 4)					
	Satisfactory (2)		Unsatisfactory (1)		Not done (0)		Satisfactory (2)		Unsatisfactory (1)		Not done (0)		Satisfactory (2)		Unsatisfactory (1)		Not done (0)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Hand hygiene	5	20	15	60	5	20	1	16.65	4	66.7	1	16.65	0	0	2	50	2	50
Personal protective equipment (PPE)	4	16	11	44	10	40	1	16.65	3	50	2	33.3	0	0	2	50	2	50
Following decontamination process steps	6	24	17	68	2	8	0	0	2	33.3	4	66.66	0	0	0	0	4	100
Occupational safety	4	16	21	84	0	0	1	16.65	2	33.3	3	50	0	0	0	0	4	100
Respiratory etiquette	3	12	7	28	15	60	0	0	3	50	3	50	0	0	0	0	4	100
Linen management	10	40	12	48	3	12	0	0	0	0	6	100	0	0	4	100	0	0
Waste management steps	13	52	10	40	2	8	0	0	4	66.7	2	33.3	1	25	3	75	0	0
Total practice scores	6	24	14	56	5	20	0	0	3	50	3	50	0	0	2	50	2	50

Table (3): Frequency and percentage distribution of the healthcare personnel according to their opinion of standard precautions in the hemodialysis unit.

Standard precautions opinion	Nurses (n = 25)				Physicians (n = 6)				Auxiliaries (n = 4)			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Hand hygiene												
Remove all Jewelry beforehand hygiene	20	80	5	20	2	33.4	4	66.7	2	50	2	50
Perform hand hygiene according to its type and its indications.	3	12	22	88	1	16.7	5	83.3	1	25	3	75
Timing of hand hygiene (Five moments)	2	8	23	92	0	0	6	100	0	0	4	100
The technique of hand hygiene according to WHO	3	12	22	88	0	0	6	100	0	0	4	100
Wearing gloves not substitute hand hygiene	7	28	18	72	4	66.7	2	33.3	4	100	0	0
Personal protective equipment (PPE)												
Wearing a uniform is mandatory in the clinical dialysis setting.	25	100	0	0	5	83.3	1	16.7	3	75	1	25
Gloves should be changed between patients.	9	36	16	64	1	16.7	5	83.3	0	0	4	100
In procedures when hands contact with secretion or excretion occurs, glove use is required.	7	28	18	72	6	100	0	0	2	50	2	50
In procedures where there is a possibility of blood splashing, apron, personal protective goggles, or face shields should be worn.	18	72	7	28	4	66.7	2	33.3	2	50	2	50
Following decontamination process steps												
Wearing proper PPE before the cleaning process.	13	52	12	48	0	0	6	100	0	0	4	100
Cleaning is the first step of the decontamination process using detergent.	10	40	15	60	0	0	6	100	0	0	4	100
Disinfection is a process used after cleaning when dealing with body fluid excreta.	8	32	17	78	3	50	3	50	0	0	4	100
Any invasive procedure (insertion of a catheter) should be implemented under the surgical aseptic technique.	4	16	21	84	2	33.3	4	66.7	0	0	4	100
Occupational safety/ Needlestick and sharps injury prevention												
It is necessary to cover broken skin.	2	8	23	92	3	50	3	50	1	25	3	75
Post needle stick injury steps should be recorded in the infection control committee	10	40	15	60	2	33.3	4	66.7	2	50	2	50
Avoid two hands technique during needle recapping.	4	16	21	84	1	16.7	5	83.3	0	0	4	100
Identifying all sharps injuries are a hazard that can lead to a risk of infection.	2	8	23	92	3	50	3	50	0	0	4	100
Seek post-exposure prophylaxis (PEP)	3	12	22	88	2	33.3	4	66.7	0	0	4	100

Table (3): Frequency and percentage distribution of the healthcare personnel according to their opinion of standard precautions in the hemodialysis unit (*Cont.).*

Standard precautions' opinion	Nurses (n = 25)				Physicians (n = 6)				Auxiliaries (n = 4)			
	Agree		Disagree		Agree		Disagree		Agree		Disagree	
	No.	%	No.		No.	%	No.	%	No.	%	No.	%
Respiratory Hygiene (etiquette)												
Cover nose/mouth with a tissue when coughing or sneezing.	18	72	7	28	6	100	0	0	2	50	2	50
When coughing, use a mask.	6	24	19	76	3	50	3	50	0	0	4	100
Use disposable tissues and discard appropriately after use	5	20	20	80	6	100	0	0	1	25	3	75
Use hand hygiene after having contact with respiratory secretions	13	52	12	48	4	66.7	2	33.3	1	25	3	75
Cough or sneeze into the upper inner sleeve.	4	16	21	84	0	0	6	100	0	0	4	100
Waste management steps												
Color coding for medical waste should be available.	20	80	5	20	1	16.7	5	83.3	1	25	3	75
Follow waste segregation according to hospital policy	23	92	2	8	0	0	6	100	2	50	2	50
Follow waste collection according to hospital policy	23	92	2	8	0	0	6	100	2	50	2	50
Storage, and handling according to hospital policy	20	80	5	20	0	0	6	100	2	50	2	50
Staff vaccination												
All healthcare providers should be vaccinated with Hepatitis B and influenza vaccine	25	100	0	0	6	100	0	0	4	100	0	0
Surveillance												
All working staff must provide a safe workplace and must assess risk at work	20	80	5	20	3	50	3	50	4	100	0	0
Track all types of infections	12	48	13	52	4	66.7	2	33.3	1	25	3	75
Evaluate the risks and decide on control measures	18	72	7	28	5	83.3	1	16.7	2	50	2	50

Table (4): Percentage distribution of the healthcare personnel according to their implementation obstacles of standard precautions in the hemodialysis unit.

Standard precautions obstacles	Nurses (n = 25)		Physicians (n = 6)		Auxiliaries (n = 4)	
	No.	%	No.	%	No.	%
Hand hygiene						
Inaccessibility/absence of hand hygiene materials	18	72	2	33.3	3	75
Five moments are time-consuming after patient touch is enough.	22	88	6	100	4	100
Following hand hygiene technique is time-consuming	25	100	6	100	4	100
Skepticism about the value of hand hygiene	5	20	6	100	3	75
Personal protective equipment (PPE)						
Gloves are hindering as a barrier during patient care.	20	80	4	66.7	4	100
Inaccessibility/ absence of PPE materials	19	76	3	50	4	100
Wearing PPE is not necessary; gloves are enough.	21	84	6	100	4	100
Skepticism about the value	17	68	6	100	4	100
Following decontamination process steps						
Following cleaning then disinfecting steps are not required, can mix in one step	25	100	4	66.7	4	100
Shortage of staff	20	80	5	83.3	4	100
Lack of knowledge	23	92	1	16.7	4	100
Occupational safety/ Needlestick and sharps injury prevention						
Heavy-duty gloves are not necessary; it is impeding the work.	24	96	6	100	4	100
Inaccessibility/absence of safety box for syringe one-unit discarding.	23	92	5	83.3	4	100
Sick healthcare providers are included in patient care	25	100	6	100	4	100
Respiratory hygiene (cough etiquette)						
Inaccessibility/ absence of masks	19	76	3	50	4	100
Lack of knowledge	22	88	3	50	4	100
Skepticism about the value cough etiquette	11	44	6	100	4	100
Waste management steps						
No need for color-coding	2	8	6	100	0	0
Segregation is not their responsibility	2	8	6	100	0	0
Staff vaccination						
No need for vaccination	10	40	0	0	3	75
Lack of knowledge	18	72	0	0	4	100
Surveillance						
Track blood-borne infectious diseases only	19	76	1	16.7	4	100
Lack of knowledge	22	88	0	0	4	100
Work overload interfere with surveillance	25	100	3	50	4	100

Table (5): Correlation between healthcare personnel total practice scores and their Socio-demographic data in hemodialysis unit (n =35).

Socio-demographic data	Total practice scores						Monte-Carlo	p
	Satisfactory (2) (n=17)		Unsatisfactory (1) (n=12)		Not done (0) (n=6)			
	No.	%	No.	%	No.	%		
Age (in years)								
20 to less than 30	7	41.1	4	33.3	2	33.3	2.748	0.602
30 to less than 40	6	35.2	5	41.6	1	16.6		
Equal or more than 40	4	23.5	3	25.5	3	50.0		
Years of experience								
Less than 1	2	11.7	2	16.6	1	16.6		
1 to less than 5	5	29.4	4	33.3	1	16.6	3.908	0.016
5 to less than10	7	41.1	4	33.3	2	3.33		
Equal or more than 10	3	17.6	2	16.6	2	33.3		
Attending Infection control training courses								
No	8	47.0	6	50.0	2	33.3	0.335	<0.001
Yes	9	52.9	6	50.0	1	16.6		

6. Discussion

The strict implementation of standard precautions (SPs) is the primary strategy for the prevention of health-associated infections (HAIs) both in healthcare professionals and in patients *(Donati, Donati, Biagioli, Cianfrocca, De Marinis, & Tartaglini, 2019)*. Although the health organizations worldwide recognize SPs as the best way to prevent HAIs *Adebayo, Labiran, and Imarhiagbe, (2015),* in different settings, it has been repeatedly shown that the level of compliance with standard precautions (SPs) guidelines is still suboptimal among healthcare providers. Although evidence-based procedures promoting appropriate practices are widely published *(Powers, Armellino, Dolansky, & Fitzpatrick, 2016; Cheung et al., 2015; Kermode et al., 2005; Luo, He, & Zhou, 2010; Moralejo, 2018*), this study aimed to identify healthcare personnel opinion and their implementation obstacles regarding standard precautions in hemodialysis unit.

This study supports previous studies *Donati, et al. (2019); Adebayo et al. (2015); Powers et al. (2016); Cheung et al. (2015); Kermode et al. (2005); Luo, He, and Zhou, (2010); Moralejo, El Dib, R., Prata, Barretti, and Correa, (2018)* in reporting unsatisfactory practice of standard precautions, a trend towards identifying the HCPs' opinion for improving their adherence to those standards.

Regarding their performance in hand hygiene, the current study showed an unsatisfactory performance level for the majority of HCP. The studied HCP reported that the standardized technique of hand hygiene is so sophisticated and time-consuming. Also, the imposed timing (5 moments) cannot be implemented with the increased workload and shortage of staff and can be confined after touching the patient in addition to the inaccessibility/absence of hand hygiene materials. Two-thirds of the physicians and all AP reported that wearing gloves is a substitute to hand hygiene and question the value of hand hygiene. This result agreed with many studies that; poor hand hygiene by healthcare professionals is a major cause of healthcare-acquired infections *(Pong, Holliday, & Fernie, 2019; Gould Moralejo, Drey, Chudleigh, & Taljaard, 2017)*.

This interpretation agreed with *Piras, Lauderdale, and Minnick, (2017),* who stated that nurses look to other nurses as a reference in hand hygiene, and they believed that hand hygiene is a protective behavior that requires time and functional equipment. *Haile, Engeda, and Abdo (2017)* reported that a very low proportion of healthcare workers were compliant with washing hands before touching a patient. Moreover, *Pong et al. (2019)* noted that hand hygiene performance varies significantly among healthcare professionals and is masked with aggregate performance reporting.

As regards wearing PPE, poor adherence to PPE was observed among nurses, physicians, although nurses were convinced that wearing the uniform as a first protective line must be implemented in any healthcare setting. The majority of studied HCP reported that they have to wear gloves while dealing with hemodialysis patients and using googles and apron where there is a possibility of blood splash, but this opinion was not translated in their performance. This finding may be due to inaccessibility/absence of PPE, and they did not feel comfortable while working with gloves, "it hinders work during patient care." This finding may be because they perceived that HH and wearing gloves were for their protection more than for patient safety.

Moreover, the studied healthcare personnel noted that there was no need to wear either eye goggles or masks, and gloves are enough. This finding was consistent with the findings of *Silva, Marques, Galhardi, Orlandi, and Figueiredo (2018),* who identified a high rate of reuse of gloves and low adherence to HH. Also, the findings of the present study consistent with *Haile et al. (2017)* who illustrated that the compliance of the HCWs with wearing a waterproof apron and eye goggles whenever there is a possibility of body fluid splashing and the compliance of HCWs in segregation of infections and noninfectious wastes into appropriate dust bins were found to be low.

Shiarif, Khdir, Khdir, and Rasul (2019) stated that PPE is not limited to the uniform only; but refers to protective clothing that acts as a barrier between people and infectious materials. In dialysis units, it should include gloves, masks, eye goggles/face shilled, and apron. A review study carried out in Saudi Arabia highlights the importance of the use of PPE in hemodialysis units, both for professional protection and for the prevention and control of HCAI *(Karkar et al., 2014).*

Khamis et al. (2017), who assess safety measures in nineteen hemodialysis units in Qalyubia Governorate, reported that only ten percent of the studied units were committed to HH. However, most dialysis units had enough supplies, and none of the studied units showed full commitment to personal protection equipment.

Cleaning and disinfecting environmental surfaces and equipment as appropriate is fundamental in reducing their potential contribution to the incidence of healthcare-associated infections (*CDC 2019)*. The findings of the present study revealed that the majority of the HCP practice decontamination process unsatisfactorily, and they did not agree to follow the steps of the decontamination process where only less than half of nurses follow linen management satisfactorily. They also reported that the process of disinfection could substitute the process of cleaning, and the majority of nurses, AP and half of the physicians did not agree to clean the contaminated equipment or supplies before disinfection and commented that they add the detergent to the disinfectant solution.

Saleh, Ali, and Afifi (2018) results showed that cleaning could be an effective method in reducing microbial loads in the hospital environment. Moreover, *Walker, (2019)* and *Ding and Liao, (2019)* emphasized that cleaning is the first and most crucial step in any decontamination process and is an essential prerequisite to ensure effective disinfection or sterilization of equipment. *Karkar et al. (2014)* emphasized that the used towels or wipes and gloves that are contaminated with blood should be discarded in a biohazard waste container and hand hygiene performed after glove removal.

The findings of the current study revealed that more than half of nurses practice waste management satisfactorily, while all the physicians either did it unsatisfactorily or did not follow, and the majority of AP did it unsatisfactorily. It was observed that the majority of nurses and half of AP agreed to follow the waste management practices while the majority of physicians did not agree, and all reported that segregation is not their responsibility, and there is no need for color-coding. *Haile et al. (2017)* found that the compliance of HCWs in the segregation of infectious and noninfectious wastes into appropriate dust bins were low.

Considering the high risk of HCAI for the patient and healthcare professionals, since they undergo repeated invasive procedures, and professionals, with the frequent handling of blood, it is of utmost importance to guarantee the ideal requirements for HH and strict aseptic technique while dealing with the cannulation process *(Silva et al., 2018).* The results of the present study highlighted that the majority of HCP either did the occupational practices unsatisfactorily or did not follow the practices at all.

Moreover, disagreement overwhelmed the results regarding occupational safety were both nurses and physicians disagreed with avoiding two hands technique during needle recapping and to follow surgical asepsis during insertion of the catheter.

Al Qahtani and Almetrek (2017) found that a quarter of nurses working in hemodialysis units recapped needles after use and passed needles from hand to hand. The majority of the studied HCP highlighted the inaccessibility or absence of safety boxes and that heavy-duty gloves impeding the work with patients. *Luo et al. (2010)* found that although the majority of nurses were in departments equipped with sharps disposal boxes, they did not use these boxes at all.

Based on the current CDC recommendations, patients with a respiratory infection is preferably dialyzed in a single room and instructed to follow respiratory hygiene/cough etiquette *(CDC, 2009).* The health-care worker caring for these patients should wear a surgical mask and perform hand hygiene as indicated *(Siegel, Rhinehart, Jackson, & Chiarello, 2007).* This finding is inconsistent with the findings of the current study where the majority of nurses, half of the physicians, and all AP disagreed with wearing a mask while coughing.

Moreover, the findings revealed that the majority of nurses and all physicians agreed to cover nose/mouth during coughing and sneezing, but it was not reflected in their practice. This finding may be due to the inaccessibility/ absence of masks, lack of knowledge, and skepticism about the value of cough etiquette, as reported by the studied HCP. The findings of the present study revealed that half of the nurses and all the auxiliary personnel perform linen management unsatisfactorily. This result may be due to the absence of separate linen carts for infected linens or carts with more than one container to separate the infected from non-infected linens. *Park et al. (2018)* emphasized that the laundry should be collected and classified as contaminated laundry or another laundry.

Khamis et al. (2017) reported that all employees had been vaccinated against the hepatitis B virus in only 57.9% of the studied hemodialysis units. The findings of the present study showed that all the studied subjects agreed to be vaccinated with Hepatitis B and influenza vaccine, and almost the majority of nurses and all the AP lacking knowledge regarding the importance of vaccination. *MMWR Recommendations (2011)* emphasized the importance of Hepatitis B vaccination for susceptible health-care workers such as hemodialysis personnel who are at risk for exposure to blood and body fluids.

The findings of the current study revealed that practices of standard precautions were unsatisfactory, and there were some obstacles such as increased workload and shortage of staff, inaccessibility/absence of materials and safety boxes, lack of knowledge, absence of separate linen carts, which interfere with the implementation of these standards. These findings were in line with *Khamis et al. (2017),* who reported that the studied hemodialysis units were ideal in terms of data recording, isolation, and dealing

with furniture and sheets. However, there was a clear error in hand hygiene, personal protective equipment, environmental cleansing, dealing with waste products, and vaccination.

Furthermore, *Osborne (2003)* found that lack of time, perceived 'low risk' of a patient, PPE is not available, and interfering with care. All of these represented some of the barriers that influence compliance with standard precautions. A high percentage of the studied subjects reported lack of knowledge as an obstacle, and this was consistent with *Yassin, Hoda and Salma, (2018)* who found that IC knowledge of the nursing staff was generally low in dialysis units due to the absence of written IC policies and procedures. IC practices' level of performance of the nursing staff was also low due to the absence of regular IC staff rounds in both dialysis units.

Surveillance for infections and monitoring adherence to recommended infection prevention practices are an essential component of an infection prevention program. Dialysis events that should be reported include intravenous antimicrobial starts, positive blood cultures, and evidence of infection at the vascular access site. Each dialysis facility should also monitor other parameters as well as adherence to standard precautions and other recommended practices as screening for HBV, HCV, HIV, and tuberculosis infections and immunizations. *Mehta et al. (2014)* The results of the current study pointed out that the majority of nurses and physicians and half the AP agree that they have to evaluate the risks and decide on infection control measures, but more than half of nurses, third of physicians and the majority of AP did not agree to track all types of infections. They reported that they have to track only blood-borne infectious diseases only and that work overload interferes with surveillance.

Yassin et al. (2018) found that healthcare personnel adherence toward standard infection control precautions was influenced by their age, qualifications, years of experience, and attendance of infection control programs. The present study revealed that there was a statistically significant correlation between attendance of infection control programs, years of experience and satisfactory level of practice, where compliance was observed among those with more years of experience specifically those from five to less than ten years and those who attend infection control training programs. This finding can be explained by the fact that those with more years of experience possessed more information related to SPs and used to practice it. Moreover, the attendance of infection control training programs improves the attitude and practice of infection control among HCP.

7. Conclusion

Unsatisfactory SPs practices showed a high percentage among HCP. Healthcare personnel tends to agree to certain infection control practices over other practices. The majority disagree with following the five moments, with changing gloves between patients, clean the equipment before disinfection, avoid two hand technique in recapping, cough or sneeze into the upper inner sleeve, and seek post-exposure prophylaxis. Availability and accessibility of equipment and supplies that interfere with the application of SPs practices and lack of knowledge concerning infection prevention and control were considered as implementation obstacles of SPs practices.

8. Recommendations

- Training of HCP on SPs, together with consistent and strong management support, is recommended.
- Refreshing courses related to standard precautions practices should be conducted periodically to emphasize its importance in infection control and prevention.
- Development of national precautions after conducting researches that confirm its effectiveness.
- Replicate the study to include several hemodialysis units from different governorates to reflect the exact picture.

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