

Effect of An Educational Program on Improving Nurses Performance Regarding Infection Prevention and Control in Chest Disease Wards

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Abstract

Background: According to the WHO, infection prevention and control (IPC) is a realistic, evidence-based strategy that protects patients and healthcare professionals against preventable infections and the effects of antibiotic resistance. Numerous infection control strategies are straightforward and inexpensive, but they also call for worker responsibility, behavioral modification, and better staff education. **This study aim:** To determine the effect of implementing an educational program on improving nurses' performance regarding infection prevention and control in chest disease wards. **Setting:** Chest diseases department of Alexandria Main University Hospital. **Design:** A quasi experimental one group, pre and posttest intervention design. **Subject:** all nurses (37) who are involved in providing direct nursing care for these patients at the above-mentioned setting. **Three tools were used for data collection:** Tool I:" Nurses' Knowledge Regarding Infection Prevention and Control Measures: ' A structured Interview ". Tool II: 'Nurses' practices observational checklist regarding infection control measures among patients in the chest diseases department'. Tool III:" Nurses' Satisfaction to the Educational Program and Satisfaction Questionnaire'. **Results:** this study illustrated that there was no statistically difference as regards nurses' overall knowledge regarding infection prevention & control pre and post the educational program, on the other hand; there was highly statistically difference as regards nurses' overall performance of infection prevention & control pre and post the educational program. Negative correlation was found between nurses' knowledge and performance of IPC measures. **Conclusion:** The educational programs created for the chest disease nursing staff have a significant role in enhancing their performance of precautions in dealing with high-risk medical procedures ('Aerosol-generating procedures'), standard precautions to minimize the possibility of exposure to pathogens while collection and handling of laboratory specimens from patients with ARIs, care, cleaning, disinfection of respiratory devices and infection prevention at chest tube insertion site.

Keywords: Educational program, Nurses performance, Infection prevention and control.

Introduction

Healthcare-associated infections (HAI), are infections acquired while getting health care that were not present at the time of admission. They can arise in a variety of settings, including hospitals, long-term care institutions, and ambulatory

settings, and they can also appear after discharge. fungal (Sikora and Zahra; 2023).

it is the most common adverse event affecting patient safety in health care. They have a major impact on morbidity, mortality, and the financial burden placed

on patients, families, and healthcare systems. In the United States, HAI affects 3.2% of all hospitalized patients, 6.5% in the European Union/European Economic Area, and the global frequency is likely significantly greater. (Magill et al; 2018).

According to estimates from the World Health Organization (WHO), of the 190 million people who visit hospitals each year throughout the world, 9 million of them get nosocomial infections on average, and about one million of these patients pass away because of these diseases. (Wahba et.al, 2016).

The most fundamental management activity to prevent infection is standard precaution. Standard precaution requires healthcare professionals to consider all patient secretions, including blood and body fluids, as potential infection sources and avoid being exposed to them in order to prevent the spread of pathogens; it is recommended that people comply with this regarding any infection before the disease is diagnosed (WHO: 2020).

Furthermore, the WHO recommends that all patients practice standard precautions, such as practicing hand and respiratory hygiene, using appropriate personal protective equipment (PPE) and linens based on risk assessment, promoting injection safety practices and safe waste management, environmental cleaning, and sterilizing patient-care equipment (WHO,2020).

Infection control education enhances health personnel' adherence to recommended safeguards. Nurses are more likely to become infected with blood-borne pathogens because of clinical blood exposure caused by sharp instrument injuries and needle-stick injuries if infection control procedures are not carefully implemented. Studies have also revealed evidence of clinical nurses becoming infected because of inadequate infection control methods. (WHO, 2016).

All nurses in a hospital are responsible for keeping an eye on patients, keeping the environment clean, and taking any other steps necessary to keep hospitals sterile and patients safe. Infection control nurses are nurses who specialize in this. They are responsible for ensuring that infection prevention and control regulations are followed and will be held personally accountable for their activities. They must be aware of their legal responsibilities to take reasonable care of their own health, safety, and security, as well as the health, safety, and security of others who may be injured by their actions, and to report suspicious activity and problem areas (Rao, 2017).

Education is required to enlighten the employees and persuade them that these measures are desirable to ensure their compliance. Consequently, to maintain infection control measures, training programs are required for both nurses and head nurses (Olans & DeMaria, 2016).

The human factor is crucial in determining whether these preventive measures are successful in reducing the likelihood of contracting a hospital acquired illness. Because of the importance of receiving proper training and instruction in these measures, this study's goal is to increase nurses' understanding of and use of infection control. This study aimed to determine the effect of implementing an educational program on improving nurses' performance regarding infection prevention and control in chest disease wards.

Materials and Methods

Research design

A quasi experimental one group, pre and posttest intervention design were used to achieve this study.

Setting:

The present study was conducted at the inpatient chest diseases department of Alexandria Main University Hospital, Egypt. The inpatient chest diseases

department has a capacity of twenty-five beds for male patients and twenty-two beds for female patients. The chest disease department has a lab for pulmonary function tests. The hospital offered nonpaid public services for all governorates in Egypt of Alexandria main university hospital (MUH).

Subjects

The participants of this study included all nurses (37) who are involved in providing direct nursing care for these patients at the above-mentioned setting.

Inclusion criteria: Aged from 25 years to less than 60 years old, currently work at the above-mentioned setting, involved in direct nursing caring, for a minimum period of one year of experience, agree to participate in the study and their number was 37 nurses.

Method

The study was accomplished as follows:

- An approval from the Research Ethics Committee Faculty of nursing, Alexandria University was obtained.
- An official permission form the Faculty of Nursing, Alexandria university was obtained and was directed to the responsible authorities of the study setting to get their permission to conduct the study after explaining the aim of the study.
- All tools of the study were developed by the researcher based on a relevant review of related literature (**Ahmed, 2017& Hemed et.al, 2017**).
- All tools were tested for content validity by five experts in the field of chest diseases and medical- surgical nursing to assure the content validity, clarity of items, comprehensiveness, appropriate translation, and necessary modifications were introduced.
- Reliability of the tools was tested using Cronbach's alpha coefficient test. Reliability of tool I was (0.923), tool II (0.963) and tool III (0.805), which means that all tools were reliable.

- A pilot study was carried out on 10% of nurses (4) to test the clarity, feasibility, and applicability of the tools. The necessary modifications were made accordingly. The pilot sample was executed from the actual study subjects.

- The data collection was started and continued for 3 months from March 2023 to May 2023. To fulfill the study aim, the program was carried out for nurses in four phases, assessment, planning, intervention & evaluation.

Phases I: Assessment phase

Initial assessment of each study participant was carried out before beginning of an implementation an educational program on improving nurses' performance regarding infection prevention and control using tools I and II to assess existing nurses' knowledge and practices.

Phases II: Planning Phase

The educational program was developed by the researchers based on the obtained data from initial assessment . It included objectives, content, and the number of sessions.

Phases III: Implementation phase:

The educational program on improving nurses' performance regarding infection prevention and control in chest disease wards was conducted in accordance and in collaboration with the two nurses who were responsible about infection control and who worked in the ward and under the supervision of the infection control committee of the University hospital in Alexandria.

The training session was implemented within working hours, for five nurses per session.

The training sessions were done three times per week covering daily shifts. The duration of each session ranged from 45- 60 minutes. Each session was started with a summary of the previous sessions and objectives of the new session. The

theoretical sessions: were conducted through group discussion using very simple language, using power point suits the level of nurses.

Three sessions of nurses' education were carried out to provide them with new knowledge. The duration of each session lasted approximately from 30 to 40 minutes:

Session (1): Introduction of infection control and health care associated infection.

Session (2): Infection control principles and practices. & standard of infection control precautions.

Session (3): Isolation precautions.

The practical sessions were provided using demonstration and ne-demonstration techniques by using real materials and instruments. Four sessions of nurses' training were carried out to provide them with new skills and practices.

The duration of each session lasted approximately from 40 -60 minutes:

Session (1): hand hygiene, wearing mask, &respiratory etiquette.

Session (2): Sharp disposal, waste disposal, administration of medication, protecting the visitors.

Session (3): How to obtain sputum sample and care for chest tube.

Session (4): Care of oxygen and nebulizer masks, and droplet precautions.

Phase IV: Program evaluation

Post testing of nurses' knowledge and performance regarding infection control were done immediately after implementation of the education program and after one month from the end of the program using tools (I&II). Subsequent assessment of nurses was done immediately after implementation of the education program and after one month from the end of the program using all using tools (I&II).

Ethical Considerations

Prior to the initial interview, the researcher was introducing himself to nurses who met the inclusion criteria; each nurse was fully informed with the purpose and nature of the study. Written informed nurses' consent to participate in the study was obtained before data collection. Witness consent was obtained from the head nurse for nurses' observation. Confidentiality of the collected data was assured throughout the study. The subjects were assured that their participation is voluntary, and they have the right to withdraw from the study at any time.

Statistical analysis

Data processing: after data was collected and transferred into specially designed formats, to be suitable for computer feeding. Data were processed and analyzed using PC with statistical package for social Sciences (SPSS ver.20). Shapiro-Wilk test, Cochran's test, Friedman test, Pearson coefficient and Cronbach's Alpha tests were used.

Results

Table (1): demonstrated the frequency of the studied nurses according to their Socio- demographic Characteristics (n = 37). Our results showed more than half (59.5%) of the studied nurses' age ranged from 40 - 50 years. As regards gender more than three thirds (75.7%) of them were females & married. According to nurses' academic qualifications, more than two thirds (73.0%) of them had a diploma in nursing. Concerning their years of experience, more than two thirds (81.1%) of them had more than 15 years of experience. according to the average of patient care / shift, about one third (35.1%) of nurses were provided care to 9-12 patient /shift. Moreover, about half of nurses (51.4%) studied infection prevention & control methods before graduation, while the other half (51.4%) of them did not study these methods. More than two thirds (83.8%) of nurses attended training programs about

infection prevention & control, and all of them (100.0%) their performance regarding infection prevention & control was improved.

Table (2): demonstrated a Comparison among the studied nurses regarding their overall knowledge of infection prevention & control measures at three different intervals pre-program, immediately post & 1 month post the program (n = 37). In relation to nurses' overall knowledge regarding infection prevention & control; had an two thirds (81.1%, 86.5%,97.3%) of them were had good knowledge pre the program, immediately post & one month post the program respectively, with no statistically significant difference were (p=0.078).

Table (3): demonstrated a comparison among the studied nurses regarding their overall performance of infection prevention & control measures at three different intervals pre-program, immediately post & 1 month post the program (n = 37). In relation to nurses' overall performance about infection prevention and control, more than two thirds (91.9%) were had unsatisfactory performance, while immediately post of the program and post one month more nearly more than two thirds of them were had satisfactory performance with highly significant deference were p(<0.001*).

Table (4) : demonstrated a correlation between nurses' knowledge, performance regarding infection prevention & control and their satisfaction with the educational program. There was no correlation between nurses' knowledge & performance regarding infection prevention and control, the same trend was observed in relation to their knowledge & their satisfaction with the education program. Furthermore, there was no correlation between nurses' performance of infection prevention and control and their satisfaction of the education program.

Discussion

Infection prevention and control (IPC), according to the WHO, is a practical, evidence-based strategy that protects patients and healthcare staff against preventable infections and the implications of antibiotic resistance. Many infection control measures are simple and inexpensive, but they also necessitate worker accountability, behavioral adjustment, and improved staff education, reporting, and surveillance systems (Bouallègue et.al, 2013).

As regards nurses' socio-demographic characteristics, this study showed that more than half of the studied nurses' age ranged from 40 - 50 years. More than three thirds of them were females & married, more than two thirds of them had diploma in nursing and had more than 15 years of experience, furthermore; about one third of them were provided care to 9-12 patient /shift.

These findings could be attributable to the fact that most nursing personnel in Egypt were graduates of diploma or technical institutes. Graduates of the Faculty of Nursing are typically assigned to care for patients in special care units that require specialized knowledge and advanced technology, or to administrative roles. With the nurse caring for 9-12 patients per shift, this demonstrates the declining nurse patient ratios.

This is supported by the study of **Ponikowski (2016)**, who said that administrators chose older age nurses to be able to execute mainly jobs in the chest disease unit successfully& more than half of the nurses in the study had degrees from technical institutes in terms of education. Also (**Shorofi, & Arbon, 2017**) stated that, most nurses working in chest disease units have nursing diplomas, and more than half of them have experience of more than five years.

In relation to studying infection prevention& control methods before

graduation, about half of nurses studied infection prevention & control methods before graduation, while the other half of them did not study these methods.

According to the researchers, nurses' infection control education enhances their adherence to conventional measures. For example, teaching infection control in nursing education is useful for preventing nosocomial infection and lowering the infection rate. Furthermore, undergraduate education of healthcare workers is critical not only in imparting knowledge of infection, prevention, and control (IPC) guidelines but also in influencing attitudes toward implementing such guidelines in clinical practice; thus, most nurses studied infection prevention and control methods in their curriculum prior to graduation.

These findings are consistent with those of (Gaheen, 2021), who discovered that most students agreed that the existing curriculum provides them with adequate information on infection prevention and control (IPC) recommendations.

In relation to nurses' overall knowledge regarding infection prevention & control; more than two thirds of them were had good knowledge pre the program, immediately post & one month post the program respectively, with no statistically significant difference.

These findings may be attributed to that, more than two thirds of the present study nurses were attended training program about infection prevention & control before this study as the Main University Hospital infection control committee sets general infection control policy and provides input into specific infection control issues. Furthermore, it provides several staff training programs regarding IPC especially at the last years as IPC is a rapidly changing field especially in the context of global spread of novel pathogens, and HCWs increased risk of infection, therefore the present study aims to share on this educational role in addition

to the effective role Main University Hospital infection control committee.

The results of the present study are congruent with Mahmoud; 2020 study's findings who showed that most nurses participated in training programs for infection control, with the average program lasting less than five years. Moreover; (Friedman ,2017) mentioned that the educational program dramatically increased nurses' knowledge in chest disease units, particularly for those engaged in direct patient care.

These findings were opposite to (Shehab, 2018) findings, who illustrated that more than half of the nurses lacked sufficient training and experience in the in-chest disease units. Therefore, it was highly advised that in-service training, monitoring, and reinforcement be provided to nurses in the chest disease unit to increase their understanding and practice of weaning. This difference highlights the effective role of Main University Hospital infection control committee and the educational program provided in this study.

Compliance with universal infection control precautions encompasses hand hygiene, personal protective equipment, sharps management as well as wastes disposal. In contrast to other isolation approaches, universal precautions are not used with specific patients. based on diagnosis or mode of transmission rather they are applied universally to all patients (Mahmoud, 2016).

Concerning nurses' performance of universal infection control precautions, there were statistically significant differences as regard hand hygiene, wearing PPE, respiratory etiquette, medication management, isolation techniques and disposal of sharps, there were statistically significant differences pre the training program, immediately post & one month post the program.

These findings were in the context of the study of (Mahmoud, 2020) who found

that there was a statistically significant difference in the total number of nurses' practice scores for patients on chest disease units before and after the educational program. Additionally, after applying the information, normal precautions for infection control become more important.

The unsatisfactory performance of universal infection control precautions especially can be attributed to hand hygiene, wearing PPE, respiratory etiquette, medication management, isolation techniques and disposal of sharps, could be contributed to nurse's noncompliance of these measures due to lack of facilities, & supplies in the previous mentioned setting, which considered one factor of hindering the performance of these measures. The performance improved post the educational program as it include two practical sessions regarding hand hygiene, wearing mask, & respiratory etiquette, sharp disposal, waste disposal, administration of medication through demonstration & redemonstrations method.

As regards precautions in dealing with high-risk medical procedures (Aerosol-generating procedures) there were statistically significant differences as regard sputum sampling, care of oxygen & nebulizers masks pre the training program, immediately post & one month post the program.

With reference to standard precautions to minimize the possibility of exposure to pathogens while collection and handling of laboratory specimens from patients with ARIs including chest tube care & sample aspiration, there were statistically significant differences pre the training program, immediately post & one month post the program.

This is in line with **(Kim ,2020)** who conducted study on developing and evaluating an educational program for respiratory infection prevention among rural elderly residents in South Korea and illustrated that the educational program

enhanced trainers' practice of oxygen mask care & respiratory etiquette.

From the researcher point of view the unsatisfactory level of nurses' performance of infection control measures pre the educational program regarding sputum sampling, care of oxygen & nebulizers masks, chest tube care & sample aspiration may be related to that the department has only posters with hand hygiene, instruction related to intravenous medications only and the visual sense is responsible for 90% of brain stimulation and that vision and visual memory take up to two-thirds of the brain, which means that posters help in retaining information and remember the staff with any missing practical points. While during & post the program each nurse kept the illustrated colored booklet the provided by the researcher to act as a reference to them.

On the other hand, the performance of nurses regarding protection of visitors of chest department remains unsatisfactory either pre the program or post the program. It can be correlated to the lack of declared hospital visitor's policies & guidelines. This finding was supported by **(Banach, 2019)** who stated that the applicability of these guidelines to visitors is uncertain and not familiar to the healthcare workers.

Regarding correlation between nurses' knowledge and performance of infection prevention & control, there was no correlation between nurses' knowledge & performance regarding infection prevention and control. This finding is in the same line with the finding of **(Mahmoud, 2016)** who revealed that there were no significant correlations between nurses' knowledge and performance of infection control standard precautions. These results might be interpreted by inadequate compliance with infection control practices among most health care workers including chest diseases department nurses. Additionally, it can be related to lack of procedures related standards or policies.

Finally, the current study's findings were compatible with the findings of (Kim,2020), who discovered that the infection control training program used was effective in increasing the applied knowledge and practical behaviors of nurses giving care.

Nurses make up the majority of HCWs. They are known as the "heart of the healthcare system" since they spend more time with patients than any other HCW. Their adherence to IPC rules is critical for limiting disease transmission among patients. As a result, adopting IPC guidelines by nurses is regarded as a cornerstone of the healthcare system and the most essential issue in reducing the prevalence of HAIs (Abdelaziz et al.,2019).

Conclusions

In conclusion, this study found that there was no statistically significant difference between nurses' overall knowledge of infection prevention and control before and after the educational program, but there was a significant difference between nurses' overall performance of infection prevention and control before and after the educational program. There was a negative association between nurses' knowledge and performance on IPC assessments.

The educational programs created for the chest disease nursing staff have a

significant role in enhancing their performance of precautions in dealing with high-risk medical procedures ('Aerosol-generating procedures'), recommended procedures to reduce the likelihood of pathogen contact while collecting and handling laboratory specimens from ARI patients care, cleaning, disinfection of respiratory devices and infection prevention at chest tube insertion site.

Declarations

Consent for publication

Not applicable.

Availability of data and materials

All data and materials are fully presented in the manuscript.

Competing interests

The authors declare that they have no competing interests.

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Author contributions

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Table (1): The frequency of the studied nurses according to their Socio- demographic Characteristics (n = 37)

Socio-demographic characteristics		No.	%
Age			
<20 years old		0	0.0
20 years – <30 years		3	8.1
30 years – <40 years		12	32.4
40 years – 50 years		22	59.5
Mean ± SD.		42.78 ± 9.53	
Gender			
Male		9	24.3
Female		28	75.7
Marital status			
Single		6	16.2
Married		28	75.7
Widow		3	8.1
Academic qualification			
Diplom in Nursing		27	73.0
Diplom + specialty		1	2.7
Bachelor's degree in Nursing		9	24.3
Years of experience			
1 year – <5 years		3	8.1
5 years – <10 years		0	0.0
10 years – <15 years		4	10.8
≥15 years		30	81.1
Average of patient care / shift			
Fewer than 3 patients		7	18.9
From 3 to 6 patients			
From 6 to 9 patients		9	24.3
From 9 to 12 patients		13	35.1
From 12 or more		8	21.6
Studding infection prevention& control methods before graduation			
Yes		18	48.6
No		19	51.4
Attended training program regarding infection prevention & control			
Yes		31	83.8
No		6	16.2
Improving performance as a result of that program? (n = 31)			
Yes		31	100.0
No			

Table (2): Comparison among the studied nurses regarding their overall knowledge of infection prevention & control measures at three different intervals pre-program, immediately post & 1 month post the program (n = 37)

Nurses 'overall knowledge	Pre		Immediately post program		Post 1 month		Test of Sig.	P
	No.	%	No.	%	No.	%		
Poor (<50%)							Q= 5.091	0.078
Fair (50 - <75%)	7	18.9	5	13.5	1	2.7		
Good (≥75%)	30	81.1	32	86.5	36	97.3		
Total Score (0 –128)							Q= 5.091	0.078
Min. – Max.	82.0 –120.0		90.0 – 126.0		95.0 – 128.0			
Mean ± SD.	104.86 ± 9.04		107.46 ± 9.63		112.1 ± 8.59			
% Score							Q= 5.091	0.078
Min. – Max.	64.06 – 93.75		70.31 – 98.44		74.22 – 100.0			
Mean ± SD.	81.93 ± 7.06		83.95 ± 7.53		87.56 ± 6.71			

SD: Standard deviation

Q: Cochran's test

p: p value for comparing between the three studied period

*: Statistically significant at p ≤ 0.05

Table (3): Comparison among the studied nurses regarding their overall performance of infection prevention & control measures at three different intervals pre-program, immediately post & 1 month post the program (n = 37)

Nursing Practices	Pre		Immediately after program		After 1 month		Test of Sig.	p
	No.	%	No.	%	No.	%		
Unsatisfactory (<80%)	34	91.9	5	13.5	1	2.7	Q=58.970*	<0.001*
Satisfactory (≥80%)	3	8.1	32	86.5	36	97.3		
Total Score (0 – 114)								
Min. – Max.	131.0 – 193.0		154.0 – 213.0		168.0 – 214.0			
Mean ± SD.	159.70 ± 15.46		192.89 ± 11.08		201.5 ± 8.86			
% Score								
Min. – Max.	57.46 – 84.65		67.54 – 93.42		73.68 – 93.86			
Mean ± SD.	70.05 ± 6.78		84.60 ± 4.86		88.38 ± 3.88			

SD: Standard deviation

Q: Cochran's test

p: p value for comparing between the three studied periods

*: Statistically significant at $p \leq 0.05$

Table (4): Correlation between nurses' knowledge, performance regarding infection prevention & control and their satisfaction with the educational program

	Pre		Immediately after program		After 1 month	
	r	p	r	p	r	p
Knowledge vs. performance	0.062	0.714	-0.192	0.256	-0.235	0.162
Knowledge vs. Satisfaction			0.012	0.943		
Performance vs. Satisfaction			-0.082	0.629		

r: Pearson coefficient

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