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The impact of handwashing guidelines on pediatric nurses' knowledge and practices in the operating room at Cairo University specialized pediatric hospital

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Abstract

Pediatric nurses in the operating room are front-line heroes who save the lives of children by avoiding and preventing the infection by thoroughly washing their hands. The current study aimed to evaluate the impact of Handwashing guidelines on pediatric nurses' knowledge and practices in the operating room.

Design: One group pre-posttest quasi-experimental research design was utilized to achieve the aim of the current study.

Setting: The current study was conducted in the operating room at Cairo University Specialized Pediatric Hospital (CUSPH).

Sample: A Convenient sample of 30 nurses who were cared for children in the operating room at CUSPH. Was participated in the study.

Tools: It was developed by the researchers, it included a structured interview questionnaire to assess personal and professional data of the nurse; nurses' knowledge assessment questionnaire to assess nurses' knowledge about hand wash measures, and nurses' practices checklist sheet to assess nurses' practice when handwashing guidelines applied.

Results: The study results revealed that there were statistically significant differences between the total mean score of nurses' knowledge before and after receiving the hand wash guidelines as well as, nurses who received the environmental health and safety measures guidelines had a higher mean score of practice.

Conclusion: The results of the current study concluded that nurses who receive the hand wash guidelines had a higher mean score of knowledge and the higher mean score of practice than before.

Recommendation: Sustainable development. It is essential to raise the awareness of operating room nurses on handwashing guidelines through education and training courses. Providing nurses with continuous training programs on infection control measures and handwashing updates is a basic requirement for providing child care safety measures.

Keywords: pediatric nurses, handwashing guidelines, knowledge and practice, operating room

Introduction

Pediatric nurses in the operating room and other health-care personnel are front-line heroes who save the lives of children by avoiding and preventing the infection by thoroughly washing their hands (WHO, 2021) [23]. Infection is one of the most common causes of death. Infection prevention is an important part of providing high-quality care in any situation. Many handwashing measures, such as proper hand hygiene and proper use of basic protective measures during invasive operations, are simple and inexpensive, but they require employee accountability and behavior changes, as well as improved employee education, reporting, and monitoring systems (Abouelhamd, 2016) [1].

Healthcare-related infections are a major problem for children in the operating room because they can lead to high morbidity, prolonged hospital stays, and increased medical costs. The role of nurses in preventing the hazards and sequelae of healthcare-related infections is extremely important. Hospital-acquired infections are usually non-existent or have an incubation period on admission and are closely monitored by agencies such as the Centers for Disease Control and Prevention (CDC) to prevent them from occurring and improve patient safety (WHO 2016) [20].

According to the World Health Organization (2019), hand washing in the operating room has been the main content of the hand washing plan since its inception, and it is still the case in

today's healthcare environment. Medical staff should have the knowledge, skills, and attitude needed to wash hands properly. Education imparts knowledge about correct procedures in many forms and also helps to update current information following changing conditions. As we all know, only a small percentage of education programs have a measurable long-term impact.

Outbreaks and healthcare-related diseases have prompted the US Centers for Disease Control and Prevention to emphasize that hand washing is a key way to reduce the spread of disease. After the 2009 swine flu spread and the 2020 COVID-19 pandemic, the awareness of the countries have been elevated concerning importance of washing hands with soap for protection against the disease. (Dogra, Mahajan, Jad & Mahajan, 2015) ^[6].

The World Health Organization (2019) recommends washing hands for at least 20 seconds before/after taking care of any sick, preparing food, eating, going to the toilet, helping people who have just used the toilet, blowing your nose or coughing or sneezing, touching any surface or human, animal, animal feed or animal excrement, And/or contact with garbage.

To perform proper surgical handwashing, the nurse must have a faucet that can be opened and closed without touch, some chlorhexidine or iodine solution, a sterile towel for hand dry, and a sterile brush for scrubbing, cleaning under the nail. Removal the Jewelry. The proper duration usually takes 2-6 minutes, no demenad to scrub for a long time (10 minutes). When rinsing, it is necessary to prevent flowback of forearms water touching hands. After finishing washing hands, dry with a sterile cloth and put on a surgical gown (Kourosh, Julie, Tamara, & H. Elfeky, 2016) ^[9].

It become observed that the top 20% of handwashing help in managing staphylococcal infections, while an increase in the frequency of washing hands by more than 35% provided low extra benefit. Cleaning with traditional soap raise the bacterial infections spreading to food three times compared to cleansing with antibacterial soap. (WHO, 2019). Interventions to enhance hand hygiene among health care givers in medical setting involves handwashing education to employees, increasing alcohol-based hand sanitizers, and written and verbal instructions (WHO, 2016) ^[20].

As the Royal College of Nursing recorded in 2016 ^[16], nurses should understand the most common types of infections, factors that predispose patients to hospital infections, how to identify people at risk of infection, and the necessary prevention and control measures to reduce the occurrence of infections. Although such educational programs can improve nurses' compliance with hygiene habits, infection prevention practices, and infection prevention knowledge, there is a lack of research aimed at educating nurses on infection prevention and prevention measures. (Perry, Potter, Ostendorf, & Hall, 2019) ^[12].

Significance of the study

Handwashing with soap is relatively rare in many nations. According to a 2015 survey on handwashing conducted in 54 countries, 38.7% of households use soap to wash their hands. According to a 2014 survey, Saudi Arabia has the highest percentage of 97 percent, the United States is in the center with 77 percent, and China has the lowest rate of 23 percent (Raffle, Ware, Borchardt, & Strickland, 2016) ^[13]. The risk is two to twenty times higher in low - income countries, with infection rates frequently exceeding 25%.

The increasing awareness of standardized handwashing procedures has encouraged the World Health Organization to increase the incidence of infections in children (Monegro, & Regunath, 2018) ^[11]. According to estimates by the World Health Organization (2019), at any given time, for every 100 hospitalized children, 7 are in developed countries and 10 are in developing countries. At least one of them will be obtained due to the incorrect application of handwashing techniques. Infections are related to healthcare. A multi-pronged approach aimed at reducing hospital infections includes implementing standards at all levels of patient care, especially hand washing, ensuring that the core components of hand washing are in place, improving the monitoring of hospital-acquired pathogens in hospitals, and ultimately improving staff education and questions. Accountability.

According to Stephanie (2017) ^[18], the habit of washing hands with soap pre and post eating can save our lives copared to any single vaccine, low the number of deaths secondary to diarrhea by nearly half, and decrease acute respiratory infections. The number of deaths caused was reduced by one to a quarter.

Empirical evidence from Sharif, *et al.* (2016) ^[17] showed that staff actions based on knowledge and attitude are critical to the performance of handwashing programs and infection prevention in personal medical facilities. The main issue is not a lack of effective preventative measures and evidence-based guidelines, but rather a lack of consistency in how these measures are implemented by medical personnel. Despite the availability of advanced surgical techniques, higher antibiotics, and modern disinfection techniques, the higher infection rate in the government established after major operations is worrying, increasing the length of hospital stay (Royal College of Nursing, 2019) ^[15].

Through empirical observation, literature review, and clinical experience in the pediatric care unit, especially the operating room, as a key area, it has been noted that children are exposed to varying degrees of infection. Nurses should strictly observe and observe the hospital's nosocomial infection prevention measures, especially the application of handwashing procedures. There is a great need to regularly or timely assess, evaluate, enhance and improve their knowledge and practice of handwashing procedures. Therefore, the purpose of this study is to evaluate the impact of handwashing guidelines on the knowledge and practice of pediatric nurses in the operating room. Ultimately, the current research results may arouse people's attention and motivation for further research in the field of handwashing measures, especially the application of handwashing in operating rooms. As well as providing guidance and recommendations that should be reflected in pediatric nursing education and practice.

The study's aim

The current study aimed to evaluate the impact of handwashing guidelines on pediatric nurses' knowledge and practices in the operating room at Cairo University Specialized Pediatric Hospital.

Research hypotheses

H1: Nurses who receive the hand wash guidelines will have a higher mean score of knowledge than before.

H2: Nurses who receive the hand wash guidelines will have

a higher mean score of practice than before.

Materials and Methods

Research design

A set of pre-and post-testing experimental research designs are used to achieve the purpose of this research.

Setting

The study was conducted in the operating room of Cairo University Specialized Pediatric Hospital (CUSPH).

Subjects

A Convenient sample of 30 nurses who were cared for children in the operating room in CUSPH has participated in this study. All nurse categories regardless of their age, years of experience were included.

Data collection tools

The required tools were developed by the researchers after reviewing the related literature through the following tools:

Structured interview questionnaire: It contained three parts

Part I: Consisted of five questions and included one part to assess personal data for the nurse as age, gender, level of education, occupation, experience in years.

Part II: Nurses' Knowledge Assessment Questionnaire: It consisted of four questions and included one part to assess nurses' knowledge about hand wash regarding definition, importance, indications, and resources.

Part III: Nurses' Practice Checklist Sheet: It consisted of eight items and included one part to assess nurses' practice during hand wash applied.

Scoring system

The nurse knowledge assessment questionnaire had a scoring system of 100 points. Each accurate answer was worth two points, an incomplete answer was worth one point, and no response was worth zero. The nurse's practice checklist included 16 points, and as the nurse demonstrated hand washing, the researcher recorded it; each correct step of hand washing was worth two points, while each erroneous step was worth zero. The total scores will be converted to 100 percent (100 points) and classified as follows: less than 60 percent (less than 60 points) as unqualified, as unsatisfactory level 60 percent and above (60 points) as qualified as satisfactory level.

Procedure for data collection

Obtained official permission from CUSPH. Nurses who meet the inclusion criteria are invited to participate in the study Each nurse was given a distinct explanation of the study's objective and nature. To achieve each nurse's acceptance and participation, obtain verbal consent.

All nurses should be interviewed and a structured interview questionnaire should be completed. The survey asks about the nurses' personal and professional information, such as their age, education level, occupation, and years of

experience. At the same time, the researchers obtained nurses' knowledge on the definition, importance, indications, and resources of hand washing, and nurses filled out a nurse knowledge assessment questionnaire as a pre-test. Before the guide, resources. This interview was conducted in the waiting area of the operating room as the first interview (20-30 minutes).

At the same time, the researchers observed that the participating nurses in the operating room filled out the nurse practice checklist for the first time before receiving hand washing instructions. After the conclusion, the researchers conducted a meeting on handwashing on the definition, definition, importance, indications, and resources of hand washing, and demonstrated and re-showed the handwashing procedure (30-40 minutes) for participating nurses.

For the second time, after receiving guidelines on the definition, importance, indications, and resources of handwashing, the researchers observed the nurses in the operating room filling out the nurse practice checklist. At the same time, the researcher filled out the nurse knowledge assessment questionnaire as a post-test for participating nurses (30-45 minutes).

Data collection started in December 2018 and ended in December 2019. The researchers prepared an Arabic guide in the form of a flayer and handed it to the nurses participating in the study after completing the data collection. It includes simple knowledge about the definition, importance, indications, resources, and applications of hand washing.

Validity and reliability

The tool was reviewed by 3 experts in pediatric nursing to test the content validity of the tools. Reliability of the tools was performed to confirm its consistency tools using coefficients' alpha and it was 0.74.

Ethical considerations

After fully describing the purpose and nature of the study, the nurse's verbal consent was obtained. The nurse was told that participation in the study was voluntary. The researchers told the participated nurses that they have the authority to withdraw from the research at any time, without justifications, and without any harm or risks to their work. Keep each nurse confidential.

Statistical analysis

Use a compatible personal computer (PC) to store and analyze data. The Social Research Statistics Package (SPSS), version 21.0 is used. Use the mean, standard deviation, and cross-tabulation of quantitative variables, and percentages of qualitative variables to encode and summarize data. The collected data are tabulated and summarized. Use appropriate descriptive and reasoning statistical tests to computerize and analyze the data. Qualitative data are expressed as frequency and percentage. chi-square test was utilized to compare among qualitative variables. Use a paired-sample t-test to compare the means. The Pearson's correlation coefficient to check linear regression between variables. Significance considered if $p < 0.05$ and highly significance if p is less than 0.001.

Results

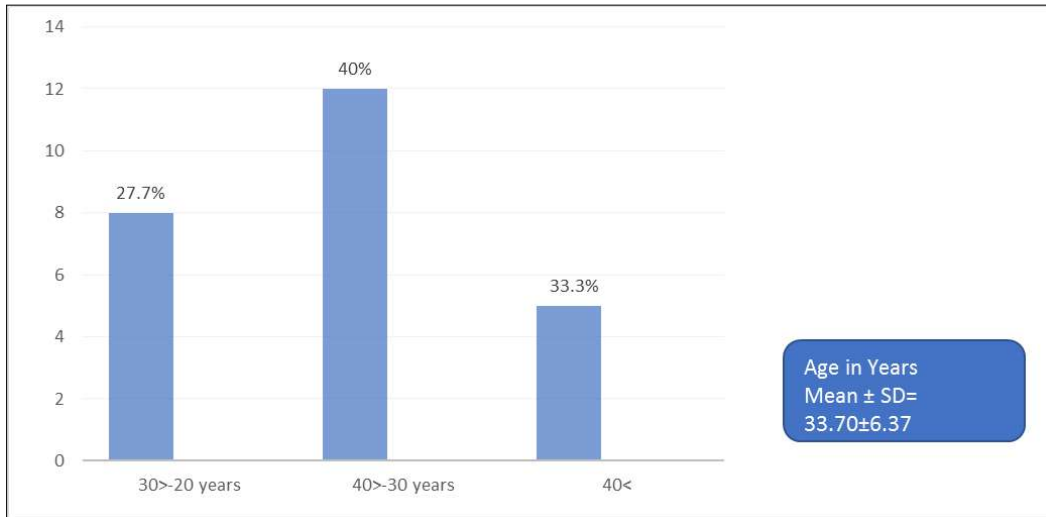


Fig 1: Age distribution of nurses (n=30).

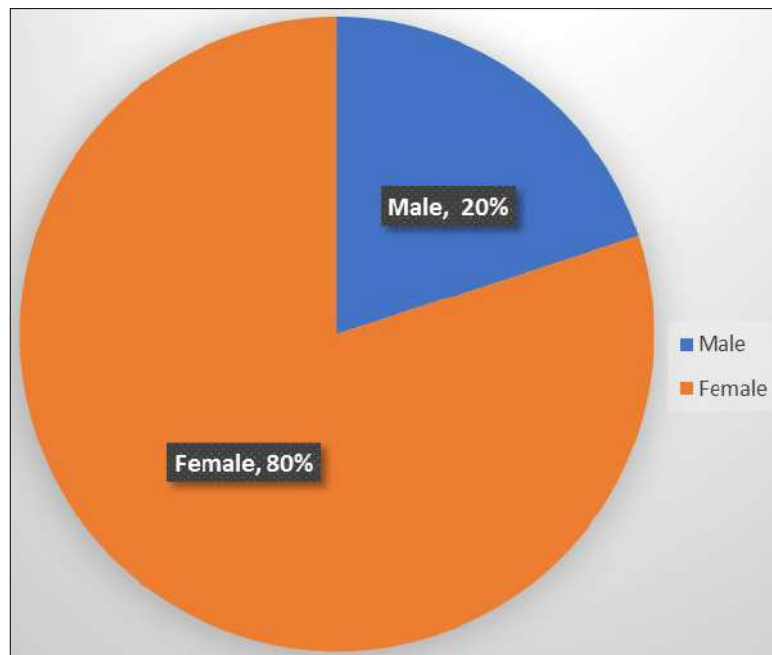


Fig 2: Gender distribution of nurses (n=30)

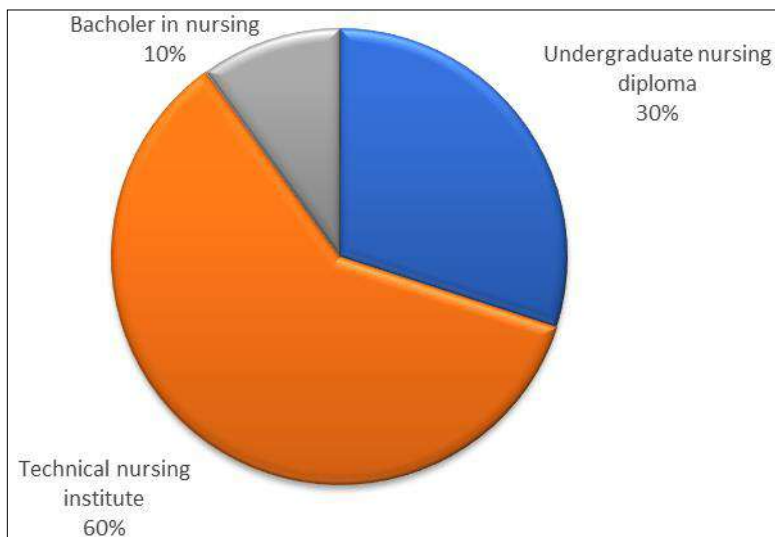


Fig 3: Nurses were categorised depending on their educational background. (n=30)

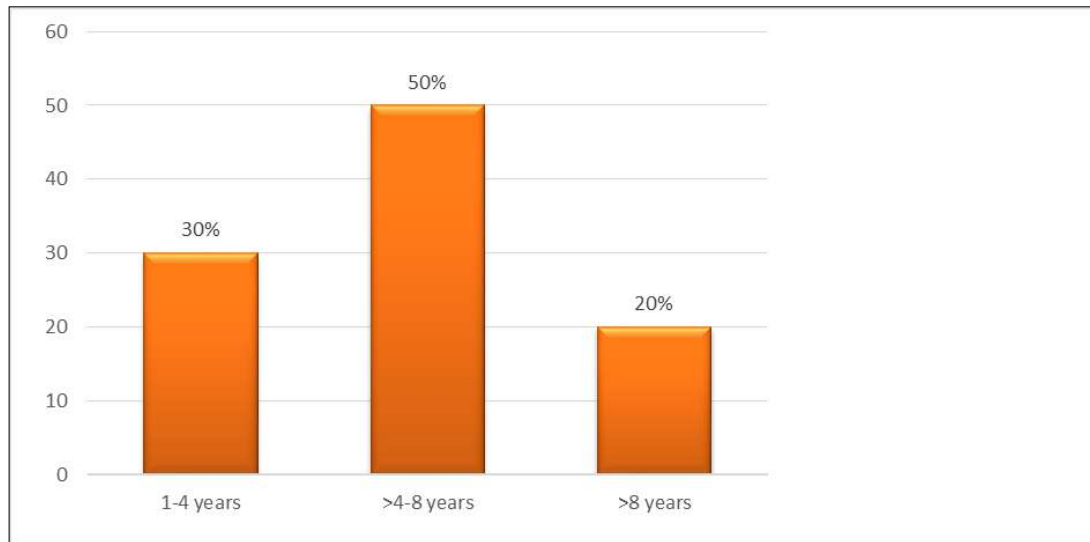


Fig 4: Nurses were distributed based on their years of experience. (n=30)

The average age of the nurses was 33.7 ±6.37 (Fig. 1), with 80 percent of them being female (Fig. 2). Approximately two-thirds of nurses had a degree from a technical nursing

institute (Fig. 3). Half of the nurses had 4-8 years of experience (Fig. 4).

Table 1: Comparison between the total mean score of nurses' knowledge before and after receiving hand wash guidelines (n=30).

Items	Beforehand wash guidelines		After hand wash guidelines		t-test	P-value
	Mean ± SD		Mean ± SD			
Definition(20 marks)	11.3±1.4		14.2±1.2		0.88	0.02*
Importance(30 marks)	23.9±1.7		27.2±1.4		0.56	0.02*
Indications (30 marks)	25.3±2.1		28.3±3.2		0.93	0.01*
Resources. (20 marks)	11.3±1.4		14.2±1.2		0.88	0.02*

* Statistically significant at P≤0.05

The table 1 showed that there was a significant difference between the total mean score of nurses' knowledge before

and after receiving hand wash guidelines in all hand washing steps related to knowledge

Table 2: Comparison between nurses' level of knowledge before and after receiving hand wash guidelines (n=30).

Level of knowledge	Beforehand wash guidelines		After hand wash guidelines		X ²	P-value
	No	%	No	%		
Satisfactory	10	33.3	17	56.6	0.29	0.05*
	60.1±2.1		68.3±2.9			
Unsatisfactory	20	66.6	13	43.3	0.33	0.03*
	41.3±2.7		47.2±1.2			

* Statistically significant at P≤0.05

Compared with before receiving the results of the hand-washing guidelines, the nurses' knowledge of hand-washing after receiving the hand-washing guidelines was

significantly improved (60.1±2.1 vs 68.3±2.9), X² 0.29, P<0.05. (Table 2)

Table 3: Correlation between nurse's age and their total mean score of satisfactory knowledge

Items	Age (in years) Mean ± SD= 33.70±6.37	r	P
Mean ± SD before handwashing guidelines	60.1±2.1	0.104	0.605
Mean ± SD After hand wash guidelines	68.3±2.9	0.142	0.331

Table (3) demonstrated that nurses' total knowledge level is positively correlated with age, and the difference between

total knowledge level and age is statistically significant.

Table 4: Comparison between nurses ' practice handwashing procedures before and after receiving hand wash guidelines (n=30).

hand wash procedure (Steps)	Beforehand wash guidelines		After hand wash guidelines		X ²	P-value
	No Done **	%	No Done**	%		
1. Wash your hands thoroughly, ideally with running water.	28	93.3	29	96.6	0.233	0.21
2. Lather up enough soap to cover the whole surface of your hands and wrists.	24	80	26	86.6	0.146	0.1
3. Create a lather by vigorously rubbing your hands together.	14	46.6	23	76.6	0.31	0.05*
4. Scrub all areas of your hands, including your fingertips, fingernails, and wrists.	12	40	24	80	0.23	0.05*
5. For at least 20 seconds, scrub your hands and wrists.	10	33.3	25	83.3	0.15	0.05*
6. Rinse your hands and wrists preferably running, water.	15	50	21	70	0.23	0.03*
7. Pat your hands and wrists dry with a clean towel or allow them to air-dry.	12	40	24	80	0.41	0.03*
8. Turn off the faucet with a towel.	9	30	22	73.3	0.3	0.05*

* Statistically significant at P ≤ 0.05. **Correct steps done by the nurses

Table 4 showed that almost all hand-washing steps were significantly different before and after obtaining hand-washing guidelines.

Table 5: Comparison between nurses ' practice before and after receiving hand wash guidelines (n=30).

The score of Nurses ' Practice	Beforehand wash guidelines		After hand wash guidelines		X ²	P-value
	No	%	No	%		
Satisfactory	10	33.3	17	56.6	0.23	0.05*
	63.1+1.1		69.3+3.9			
Unsatisfactory	20	66.6	13	43.4	0.73	0.03*
	44.3+2.7		52.2+1.2			

* Statistically significant at P ≤ 0.05

Compared with before receiving the hand-washing guidelines, nurses' practice of hand-washing measures after receiving the hand-washing guidelines was significantly improved (63.1+1.1) and 69.3+3.9), X² 0.23, P<0.05. (Table 5)

Discussion

The results of the current study documented that most of the nurses studied were women, and nearly two-thirds of them graduated from the College of Nursing Technology. The average years of experience caring for pediatric children in the operating room range from 4 to less than 8 years. Regarding the personal and professional data of nurses, it is obvious from the current research results that more than half of the nurses studied are from 30 to under 40 years old. This finding is consistent with Ghalya's & Ibrahim (2016) [7] emphasized the need to protect this group of workers in their prime of life from hospital infections. This result contradicted Sharif, *et al.* (2016) [17] who studied Knowledge, Attitude, and Performance of Nurses toward Hand Hygiene in Hospitals and reported that Most of participants were male and were had BScN degree had working experience 10 years. Compared with before receiving the hand-washing guide, after receiving the hand-washing guide, returning to the hand-washing knowledge level shown in Table (2), the level of hand-washing knowledge is significantly improved. This result demonstrates the effectiveness of handwashing guidelines and supports current research hypothesis 1.

This result is consistent with Abou elhamd 2016 [1], which found that the post-intervention phase revealed a higher level of knowledge compared to the pre-intervention phase. In addition, compared with the pre-intervention stage, the post-intervention stage showed higher total knowledge and practice scores. Similarly, Stephanie, 2017 [18], studied the effectiveness of educational programs when measuring the knowledge level of occupational exposure and universal

preventive measures to improve the knowledge and compliance of medical staff to standard preventive measures, and found that participants had higher levels of knowledge after receiving interventions.

In addition, Al Yousef 2017 assessed the impact of nursing guidelines on handwashing on the performance of interns in the School of Applied Medicine and found that nursing students reported that after implementing the guidelines, they had Knowledge has improved significantly. In addition, he reported that most nursing students have significantly improved their general knowledge (general and specific) in issuing the guide, ranging from intermediate to good. Adly, Amin, and Abdelaziz, in 2017 [2], found that there were statistically significant differences before, immediately after, and at follow-up. Immediately after the intervention, the nurses compared the purpose and indications of the standard preventive measures and had a satisfactory understanding of them during follow-up.

The researchers explained that because of the intervention, refreshing participants' knowledge has a positive effect. This study showed that there was a significant positive correlation between the knowledge of handwashing guidelines and the age of nurses as docummented by Stewardson *et al.* 2016 [19], also Mengesha, Kasa, Saravanan, Berhe, and Wasihun stated in 2016 [10] that to improve compliance, "cultural changes must be made by improving hospitals and their materials and allowing healthcare workers to provide feedback on infection rates and target areas. On the same line Belela-Anacleto, *et al.* 2019 [4]; Adly, Amin, and Abdelaziz, 2017 [2] showed that nurses scored higher in knowledge, practice, and compliance with standard hand-washing standard preventive measures immediately after the intervention, and this improvement reflects a statistically significant difference.

According to the practice level of handwashing practice in Table (5), nurses' handwashing practice after receiving handwashing instruction is significantly improved compared

with before receiving handwashing instruction (63.1+1.1) and 69.3+3.9), $X^2 0.23, P < 0.05$.

This may be a possible reason for the low level of knowledge in the current research. This may be due to the lack of service update training on handwashing guidelines. Therefore, the research results support the following findings: The application of hand-washing nursing guidelines can effectively improve the knowledge and practice of nurses in any medical institution. Therefore, hospital managers should provide support and resources in the form of education and training opportunities aimed at increasing the awareness and application of handwashing procedures among health care workers (Gould, *et al.* 2017) [8]. On the same line, (Bouallègue, *et al.* 2017) [5]. Documented that right handwashing and different simple techniques can lessen the prevalence of catheter-associated bloodstream infections through 66%

The researcher discovered that most nurses use alcohol-based hand massages instead of hand washing on a continuous basis. Although use of alcohol-based hand rubs, are faster and easier to use than normal washing, destroy many of the organisms. However, they are only effective when used on clean hands. Due to their low viscosity and rapid evaporation, special attention must be paid to ensuring that all hand surfaces are thoroughly touched.

However, preventing infection is the main concern of all health workers and health policymakers. Care is essential to the success of any prevention program designed to reduce the incidence of infections in our medical institutions. Therefore, nurses must have sufficient knowledge and demonstrate practice to achieve the goal of infection prevention. Hand hygiene resources and health professionals' compliance with hand hygiene recommendations should be audited on a regular basis, with the results reported back to health professionals in order to enhance and maintain compliance levels. (Belela-Anacleto, *et al.* 2019; Gould, *et al.* 2017 & Mengesha, Kasa, Saravanan, Berhe, & Wasihun, 2016) [4, 8, 10].

Conclusions

The results of the current study concluded that the average knowledge and practice average scores of nurses who received the hand-washing guidelines were higher than before. Therefore, hand washing guidelines are essential to minimize the incidence of infections in the operating room.

Recommendations

The researchers proposed the following to enhance nurse handwashing behaviors based on their findings:

1. Periodic and consistent handwashing training should be established through:-
 - Providing nurses with hand-washing handouts is critical when caring for children in the operating room.
 - Create a comprehensive hand-washing plan for nurses to follow from the time the child is admitted to the time he or she is discharged from the operating room.
 - Implement a continuing education program to keep nurses up to date on the importance of handwashing in the operation room.
2. Further research must be conducted to investigate factors that contribute to nurses' knowledge and practice in the use of alcohol-based hand rubs (ABHRs).
3. It is necessary to replicate this research, which will

increase the chances of extending the research results to other pediatric clinical settings.

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References

1. Abou Elhamd GL. Impact of an infection-control program on nurses' knowledge and attitude in pediatric intensive care units at Cairo University hospitals. *J Egypt Public Health Assoc* 2016;89(1):22-8.
2. Adly F, Amin A, Abdelaziz M. Improving Nurses' Compliance with Standard Precautions of Hand wash in Pediatric Critical Care, [World Journal of Nursing Sciences] 2017;35(2):01-09.
3. Al Yousef SA. Effect of Nursing Guidelines Regarding Hand wash on Performance of Internship Students in Applied Medical Science College. [Journal Of Nursing and Health Science] 2017;3(4):37-46.
4. Belela-Anacleto A, Kusahara DM, Peterlini M, Pedreira M. Hand hygiene compliance and behavioural determinants in a paediatric intensive care unit: An observational study. *Australian critical care : official journal of the Confederation of Australian Critical Care Nurses* 2019;32(1):21-27. <https://doi.org/10.1016/j.aucc.2018.02.010>
5. Bouallègue O, Naija W, Said H, Nouria A, Jaidane N, Dhidah L *et al.* Incidence of ICU acquired nosocomial infections in University Hospital of Sahloul (Sousse-Tunisia). *Antimicrobial Resistance and Hand wash* 2017;2(1):P233.
6. Dogra S, Mahajan B, Jad R, Mahajan B. Educational interventions to improve knowledge and skills of interns towards prevention and control of hospital-associated infections. *Int J Appl Basic Med Res* 2015;5(1):S54-7. doi: 10.4103/2229-516X.162279. [PubMed: 26380213].
7. Ghalya HA, Ibrahim Y. Knowledge, Attitudes and Sources of Information among Nursing Students toward Hand wash and Standard Precautions. [Life Science Journal] 2016;11(9):249-260.
8. Gould DJ, Moralejo D, Drey N, Chudleigh JH, Taljaard M. Interventions to improve hand hygiene compliance in patient care. *The Cochrane database of systematic reviews* 2017;9(9):CD005186. <https://doi.org/10.1002/14651858.CD005186.pub4>
9. Kourosch A, Julie B, Tamara C, Elfeky H. Preventing surgical site infections Getting started kit. [Life Science Journal] 2016;11(9):249-260.
10. Mengesha R, Kasa E, Saravanan M, Berhe F, Wasihun G. Aerobic bacteria in post surgical wound infections and pattern of their antimicrobial susceptibility in Ayder Teaching and Referral Hospital, Mekelle, Ethiopia. *BMC Res. Notes* 2016;7(575):4-9. [PubMed].
11. Monegro AF, Regunath H. Hospital acquired infections. Stat Pearls Publishing, Treasure Island

- (FL) 2018.
12. Perry A, Potter P, Ostendorf W, Hall AM. Fundamentals of Nursing. 8th ed. St. Louis: Mosby Company 2019, 1355-1256.
 13. Raffle H, Ware L, Borchardt A, Strickland H. High prevalence of hospital-acquired infections caused by gram-negative carbapenem resistant strains in Vietnamese pediatric ICUs: A multi-centre point prevalence survey. *International Journal of Pharmacy and Biological Sciences (IJPBS)* 2016;5(6):76-71.
 14. Richards MJ, Russo L. Surveillance of Hospital Acquired Infections in Australia One Nation, Many States. [*Journal of Hospital Infection*] 2017;65(2):174-181.
 15. Royal College of Nursing, Essential practice for infection prevention and control Guidance for nursing staff, London: RCN. 2012; Publication code: 004 166. In Eskander H G., Morsy W Y., Elfeky H A: Intensive Care Nurses' Knowledge & Practices Regarding Hand wash Standard Precautions At A Elected Egyptian Cancer Hospital. *Journal Of Education And Practice* 2019;4(19):160-174.
 16. Royal College of Nursing. Essential practice for infection prevention and control Guidance for nursing staff, London: RCN; Publication code: 004 166. In Eskander H G., Morsy W Y., Elfeky H A: Intensive Care Nurses' Knowledge & Practices Regarding Hand wash Standard Precautions At An Elected Egyptian Cancer Hospital. *Journal of Education and Practice*. 2013-2016;4(19):160-174.
 17. Sharif A, Arbabisarjou A, Balouchi A, Ahmadidarrehsima S, Kashani HH. Knowledge, Attitude, and Performance of Nurses toward Hand Hygiene in Hospitals. *Global journal of health science* 2016;8(8):53081.
<https://doi.org/10.5539/gjhs.v8n8p57>
 18. Stephanie A. The effectiveness of educational programs to improve the knowledge and compliance of healthcare workers towards standard precautions. Unpublished Master thesis of Nursing at The University of Hong Kong 2017, 40-45. available at:
<http://hub.hku.hk/bitstream/10722/131454/3>.
 19. Stewardson AJ, Sax H, Gayet-Ageron A, Touveneau S, Longtin Y, Zingg W *et al.* Enhanced performance feedback and patient participation to improve hand hygiene compliance of health-care workers in the setting of established multimodal promotion: a single-centre, cluster randomised controlled trial. *Lancet Infectious Diseases* 2016;16(12):1345-55. [PUBMED: 27599874] [PubMed] [Google Scholar]
 20. WHO. Health Care-associated Infections Fact Sheet 2016. [Cited 2016 May 04]. Available from: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf.
 21. WHO. Health Care-associated Infections Fact Sheet 2019. [Cited 2019 August 23]. Available from: http://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf.
 22. World Health Organization. Global Alert and Response. Geneva: World Health Organization 2002, 2017. Available at: <http://www.who.int/ihr/global>. October 2017
 23. World Health Organization. WHO_HH-Community-Campaign 2021.