Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v31i8.7382

EVALUATING THE IMPACT OF TRIAINING ON HOSPITAL WASTE MANAGEMENT: A PRE AND POST-TEST ANALYSIS

Hafiz Aamir Ali Kharl[1], Faryal Shaikh[2], Likowsky Desir[3], Tariq Rafique[4*]

[1]Lecturer, Department of Pharmacy, University of Agriculture Faisalabad, Pakistan
[2]Senior Lecturer, Department of Community Medicine, Fazaia Ruth Pfau Medical College (FRPMC) Karachi, Pakistan
[3]MPH, MSc, Department of Surgery, Wyckoff Heights Medical Center, United States
[4*]Assistant Professor Dadabhoy Institute of Higher Education, Karachi, Pakistan

***Corresponding Author:** Tariq Rafique
[*]Assistant Professor Dadabhoy Institute of Higher Education, Karachi, Pakistan

Abstract

Background: Hospital waste management is critical for maintaining safety and hygiene in healthcare settings. Training programs are implemented to enhance healthcare workers' knowledge, adherence to protocols, awareness, use of personal protective equipment (PPE), and confidence in handling hospital waste. However, what needs to be noted is that the outcomes of these programs can be positive or negative.

Objectives : The purpose of this research was to assess whether a specific training had any effect on the hospital waste management outcomes in MEO Hospital Lahore by using the pre- and post-training questionnaires containing the staff (1).

Methods : The experimental method was employed in this study and this entails the use of pre- and post-tests to determine the efficacy of the training program. A closed questionnaire was filled by the healthcare staff such as doctors, nurses and other health care personnel, before and after the training program. The survey focused on recruit knowledge on protocols to be followed, types of wastes, knowledge of the use of PPEs and confidence level. Descriptive statistics were employed to calculate the means while t-tests were used to compare the means of variables before and after the intervention, to establish their significance (2).

Results : Similarly the paired t-tests did not show any enhancements in the level of knowledge (p = 1. 00) pertaining to the use of protocols and identifying the categories of wastes, personal protective gears utilized (p = 0. 25) along with the confidence level (p = 0. 91) among the staff after the trainingv (3).

Conclusion : Despite the training that was conducted to workers of MEO Hospital Lahore, the study did not show an appreciation of proper hospital waste management. It is therefore recommended that there should be improved healthcare worker's Waste Management training methods which are more specific, participatory and sustained to improve the coping assets of the healthcare workers. Therefore, the outlined elements should be integrated into future training programs to gain the desired results (4).

Keywords: Hospital Waste Management, Training Program, Pre- and Post-Test, Healthcare Workers, Knowledge, Protocol Adherence, Awareness, PPE Use, Confidence, MEO Hospital Lahore (5).

Literature Review

Introduction

Medical waste disposal is one of the key responsibilities of health care facilities with an aim of protecting health consumers as well as the ecology in general. The efficiency of hospital waste management is determined by individual knowledge and awareness of protocols that the healthcare personnel holds and follows. These aspects are usually improved by the use of training programs; however, the effectiveness varies across these environments. This literature review aims at identifying prior studies concerning the hospital waste management training and highlighting their method of conducting the pre- and post-training test/assessment and, where relevant, their correlation with the current research work conducted at MEO Hospital Lahore (6).

The management of hospital waste plays a very important role in health care provision to patients.

Waste management in a hospital is a significant issue due to risks such as infections from dangerous compounds, injuries from wrong disposal of hospital waste, and environmental pollution. WHO established that health care wastes that are managed improperly have a dangerous risk to the workers, patients, and other community members. Hence, appropriate measures of waste management systems and trainings for the employees should be part of basic principles of healthcare waste management (WHO, 2014).

Training and Its Effect on the Control of Waste

Training programs seek to increase the healthcare workers' understanding and compliance with respect to waste disposal and also raise workers' self efficacy with regard to waste disposal. According to the available literature, improved organization of training has been proved to result in massive changes in these aspects. In their study, Kumar et al. (2015) observed a fair improvement in knowledge and practice regarding waste administration in healthcare workers that received a focused training initiative. Likewise, Patil and Pokhrel (2016) observed enhancement in the compliance viewpoint with waste segregation and disposal in the post-training assessment (7).

Technique for Measuring Training Effectiveness

In the evaluation of training programs, pre and post tests are commonly used, testing participants' knowledge, awareness and practice, before and after the training intervention. Further, different studies apply coupled t-tests in order to establish the degree to which the changes are statistically significant. This approach of data collection means that the researcher has a comparison point of the participants' response hence making it easier to deduce the extent of training success (8).

For instance, in a work conducted by Gupta et al (2017), a pre- and post-test research design was used to evaluate the effect of training in waste management among hospital employees. The findings showed that the knowledge of the trainees on waste management increased as well as their level of compliance to the protocols, hence the success of the training. Along the same line, Sharma et al (2018) undertook a study where paired t-tests were used to assess the effectiveness of a training program; the results showed significant improvements in the participants' handling of waste (9).

Study at MEO Hospital Lahore

This cross sectional study was carried out at MEO hospital Lahore specifically to assess the effectiveness of training in modifying the practices in hospital waste management. The questions that were asked in the survey were knowledge-based questions and questions related to the awareness of set protocols, use of personal protective gears and confidence levels. However, contrary to the findings that the training program is well structured to enhance the various aspects of the employees, the results of the paired t-tests suggested that none of the assessed domains depicted significant enhancement (10).

These outcomes are different from the majority of current works that Research Institute found showing that training has a positive effect on the management of waste. It may be due to the

training content, training duration or the mode of training, or participants' baseline knowledge and perception about waste management that may have no major modification at MEO Hospital Lahore (11).

Discussion

Therefore, it can be deducted from the findings of the study conducted in MEO Hospital Lahore that the training program, as introduced, could not work to bring the desired changes and improvement in the targeted waste management practices. This result shows how training processes should be periodically assessed and made more relevant and satisfactory to the healthcare staff as well as responsive to the problems encountered in the handling and disposal of wastes in hospitals (12).

Earlier works have also elaborated that the training methods should be local and should include interaction and practical exercises to show a positive impact. So, it will be beneficial for successive training programs of the MEO Hospital Lahore to find ways of integrating these elements (13).

Methodology

1. Data Collection

The data was gathered through the hospital staff of MEO Hospital Lahore via self-structured questionnaires. The survey aimed to assess the impact of training on hospital waste management practices. Participants included doctors, nurses, and other healthcare professionals.

2. Survey Design

The survey included questions designed to measure the following aspects before and after training:

- **Knowledge of hospital waste management**
- **Adherence to waste management protocols**
- **Awareness of waste categories**
- **Use of personal protective equipment (PPE)**
- **Confidence in handling hospital waste**

The responses were collected at two time points:

- **Pre-training: Before the participants underwent the training**
- **Post-training: After the participants completed the training**

3. Data Preparation

Data was compiled into a CSV file for analysis. Key steps in data preparation included:

- **Checking for Missing Data: Ensuring completeness of the data collected.**
- **Cleaning Data: Removing any inconsistencies or errors in the responses.**

4. Data Transformation

To facilitate statistical analysis, categorical survey responses were converted to numerical values using the following mappings:

- **Knowledge:**
  - **'Very Poor': 1**
  - **'Poor': 2**
  - **'Fair': 3**
  - **'Good': 4**
  - **'Very Good': 5**
  - **'Excellent': 6**
- **Protocol Following:**
  - **'Never': 1**
  - **'Rarely': 2**
  - **'Sometimes': 3**
  - **'Often': 4**

- **'Always': 5**
- **Awareness of Waste Categories and PPE Use:**
- **'No': 0**
- **'Yes': 1**
- **Confidence:**
- **'Not confident': 1**
- **'Slightly confident': 2**
- **'Moderately confident': 3**
- **'Very confident': 4**
- **'Extremely confident': 5**

5. Statistical Analysis

The impact of training was evaluated using paired t-tests to compare pre-training and post-training responses. This test is appropriate for comparing the means of two related groups.

Variables Analyzed:

1. **Knowledge Before and After Training**
2. **Protocol Following Before and After Training**
3. **Awareness of Waste Categories Before and After Training**
4. **PPE Use Before and After Training**
5. **Confidence Before and After Training**

Hypotheses:

- **Null Hypothesis: There is no difference in the variable (e.g., knowledge, protocol adherence) before and after training.**
- **Alternative Hypothesis: There is a significant difference in the variable before and after training.**

6. Interpretation of Results

p-value: The probability that the observed difference is due to chance. A p-value less than 0.05 indicates a statistically significant difference.

Test Statistic: Indicates the direction and magnitude of the difference.

7. Results

The paired t-tests were conducted for each variable, and the following results were obtained:

- **Knowledge: No significant change (p-value = 1.0).**
- **Protocol Following: No significant change (p-value = 0.42).**
- **Awareness of Waste Categories: No significant change (p-value = 0.51).**
- **PPE Use: No significant change (p-value = 0.25).**
- **Confidence: No significant change (p-value = 0.91).**

Results of the Statistical Analysis

1. Descriptive Statistics

- **Age**: Most respondents are in the "55 and above" age group.
- **Gender**: A significant portion of respondents preferred not to disclose their gender.
- **Role**: The most common role among respondents is "Other."
- **Years Worked**: Most respondents have worked in the hospital for "4-6 years."

Age	**55 and above**	**23**
Gender	**Prefer not to say**	**29**
Role	**Other**	**19**
Years Worked	**4-6 years**	**23**
Knowledge Before Training	**Very Good**	**23**
Protocol Following Before Training	**Never**	**19**
Awareness of Waste Categories Before Training	**Yes**	**47**
PPE Use Before Training	**No**	**46**

Confidence Before Training	**Very confident**	**22**
Training Satisfaction	**Very Satisfied**	**18**
Training Relevance	**Very relevant**	**24**
Understanding Improvement	**A little**	**22**
Materials Clarity	**Disagree**	**21**
Knowledge Application	**Moderately likely**	**18**
Knowledge After Training	**Poor**	**21**
Protocol Following After Training	**Sometimes**	**22**
Awareness of Waste Categories After Training	**Yes**	**43**
PPE Use After Training	**Yes**	**45**
Confidence After Training	**Extremely confident**	**21**
Impact Extent	**Somewhat**	**23**
Reduction in Incidents	**Yes**	**44**
Training Effectiveness	**Neutral**	**20**
Recommend Training	**No**	**45**

2. Paired Sample T-Test

The paired sample t-test was performed on three variables to compare pre- and post-training responses:

We will conduct paired t-tests for the following variables:

Knowledge Before and After Training
Protocol Following Before and After Training
Awareness of Waste Categories Before and After Training
PPE Use Before and After Training
Confidence Before and After Training

First, we need to ensure the categorical variables are converted to numerical values for the t-tests.

Step-by-Step Approach:

Inspect Unique Values: Check the unique values in the columns for any unexpected entries.
Apply Mapping Correctly: Convert the categorical responses to numerical values.
Perform Paired t-tests: Conduct paired t-tests on the numerical data.

There are some values like "Excellent" that were not accounted for in the initial mapping. Let's update the mapping to include all unique values and then reapply the mapping.

Updated Mapping

Knowledge: {'Very Poor': 1, 'Poor': 2, 'Fair': 3, 'Good': 4, 'Very Good': 5, 'Excellent': 6}
Protocol Following: {'Never': 1, 'Rarely': 2, 'Sometimes': 3, 'Often': 4, 'Always': 5}
Awareness and PPE Use: {'No': 0, 'Yes': 1}
Confidence: {'Not confident': 1, 'Slightly confident': 2, 'Moderately confident': 3, 'Very confident': 4, 'Extremely confident': 5}

We will then reapply the mapping and perform the paired t-tests again.

Reapply Mapping and Conduct Paired t-tests

Here are the results of the paired t-tests comparing the pre-training and post-training responses:

Knowledge Before and After Training:
  Statistic: 0.0
  p-value: 1.0
Protocol Following Before and After Training:
  Statistic: -0.81
  p-value: 0.42
Awareness of Waste Categories Before and After Training:
  Statistic: 0.66
  p-value: 0.51
PPE Use Before and After Training:

Statistic: -1.15
p-value: 0.25
Confidence Before and After Training:
Statistic: -0.11
p-value: 0.91

Interpretation of Results

p-value: The p-value indicates the probability that the observed difference is due to chance. A p-value less than 0.05 typically suggests that the difference is statistically significant.

Statistic: The test statistic indicates the direction and magnitude of the difference.

Analysis

Knowledge: No significant change (p-value = 1.0).
Protocol Following: No significant change (p-value = 0.42).
Awareness of Waste Categories: No significant change (p-value = 0.51).
PPE Use: No significant change (p-value = 0.25).
Confidence: No significant change (p-value = 0.91).

None of the variables showed statistically significant changes before and after the training based on the paired t-tests. This suggests that the training did not have a measurable impact on these aspects of hospital waste management practices as per the collected data.

- **Knowledge**: No significant difference between pre- and post-training scores (p-value = 1.000).
- **Protocol Following**: No significant difference in following protocols before and after training (p-value = 0.422).
- **Confidence**: No significant change in confidence levels after training (p-value = 0.912).

3. Normality Test (Shapiro-Wilk Test)

The Shapiro-Wilk test was applied to check if the data is normally distributed:

- All variables have p-values less than 0.05, indicating that the data is not normally distributed. This suggests that non-parametric tests might be more appropriate.

Discussion

The evaluation of the training program on hospital waste management at MEO Hospital Lahore, using a pre- and post-test design, yielded unexpected results. Contrary to many studies that have demonstrated the positive impact of training on healthcare waste management practices, this study found no statistically significant improvements in the key areas of knowledge, protocol adherence, awareness, PPE use, or confidence levels among the staff (14).

Analysis of Results

The lack of significant improvements in the evaluated aspects suggests several potential reasons:

1. **Training Content and Delivery**: The effectiveness of training programs heavily depends on the content and delivery method. The training provided at MEO Hospital Lahore might not have been tailored adequately to address the specific needs and challenges faced by the staff. Interactive and practical training components have been shown to be more effective than purely theoretical approaches. The training sessions may need to be revised to include more hands-on activities, case studies, and real-life scenarios (15).
2. **Participant Engagement:** This means that the extent to which people participate and are interested in various forms of training can greatly affect the results of the training. The effect, however, would be marginal in case the staff members received insufficient motivation or considered the training unnecessary and unrelated to their work. There might be a way of enhancing the outcomes, for instance, Staff inclusion in the planning process of organizational training and the focusing of the staff on the utilitarian aspect of the training (16).
3. **Baseline Knowledge and Practices**: If the staff members possessed good baseline knowledge and implements the best maintaining practices, the chances of achieving additional quantitative changes would be less. In such practices, the training programs should cover other topics to be

downloaded by the professionals in the same incremental manner as the continuous professional development is accomplished (17).

4. **Assessment Tools:** It is also quite possible that the instruments employed to measure the extent of training outcomes and effectiveness are not capable of capturing the change in the learning process at this profound level. Some more detailed and specific kinds of tests, such as direct observation and practical assessments, may give a better idea of the training's success (18).

5. **Duration and Frequency of Training**: The length and the frequency of the training sessions could also be identified as an important factor. Training that is done in shorter and less often is not likely to bring the desired behavioral changes. Perhaps, further training with more and weekly refreshers could enhance learning and guarantee the consistent use of new practices (19).

Comparison with Previous Studies

In this regard, the findings of the current study do not support the literature of MEO Hospital Lahore that established a marked enhancement in the waste management practices after delivering training sessions. Example, Kumar et al. (2015) and Patil and Pokhrel (2016) noted that at the end of the mastery and mastery-approach training they offered, the knowledge, protocol, and general waste management of the subjects offered enhanced results. Thus, the results for US students underscore the necessity of context-sensitive training initiatives and imply that effective approaches in one environment may not necessarily be translated into other environments intact (20).

Implications for Future Training Programs

The findings of this research can be useful in explaining the difficulties that are inherent in providing relevant training for healthcare organizations. Future training initiatives at MEO Hospital Lahore should consider the following recommendations to enhance their effectiveness: Future training initiatives at MEO Hospital Lahore should consider the following recommendations to enhance their effectiveness (21):

1. Tailored Training Programs: Reach out for the appropriate training that focuses on the situation in the particular region and which is oriented to the difficulties met by the hospital staff. This could include the need to establish the extent of the specific need and areas that would require intervention (22).

2. Interactive and Practical Components: To this end, you should engage the use of activities and games that will enable the trainees to be as active as possible, for example: workshops, simulations and role playing. Therefore, aspects of the implementation process where the staff of a PPS organization is equipped with tools for applying what has been learnt make the details efficient and effective in the enhancement of the four features of retention and implementation of best practices (23).

3. Continuous Professional Development: Set up a program that will provide continuing education to the staff members so that they can make sure that they are practicing the current recommended practices and policies in managing hospital wastes. Revision courses also come in handy since they can remind learners and elicit the highest standards in them (24).

4. Enhanced Assessment Methods: Engage in numerous forms of assessment such as observation, practical and or performance assessment, and participants' self/peer evaluation to assess the effectiveness of the training. It can all contribute to what has to be done in order to drive the objectives of the training programs, whether these objectives are aimed at improving inefficient work procedures, enhancing the performance of participants, or improving their overall efficiency (25).

5. Engagement and Motivation: Obtain increased cooperation from staff by making them part and parcel of program's planning and designing process. Stressing on the probability of utilizing acquired knowledge within the organization's setting and their own day-to-day activities can also assist in inspiring the participants and improve the quality of the training (26).

Conclusion

The assessment of the designed and implemented training program at MEO Hospital Lahore that targeted the hospital's waste management depicted that significant changes in the amount of knowledge and awareness regarding waste segregation, management protocols, utilization of personal protective equipment and confidence level among the staff were not brought up by the training program. Thus the following can be regarded as critical considerations when designing and/or implementing effective training programs in health care organizations. The absence of improvements to a greater extent might confirm that the content of the training and the selected approaches could be insufficiently adapted to address the needs and demands of the working staff in the hospital. In addition, such parameters as participants' interest, their initial level of knowledge, length of training sessions, and frequency of training all influence the success of such types of training. In terms of future endeavors, there must be creation of intervention and training suites that are in tune with the contextual nature of the workplace and the practical hands on training. Continuous professional development and regular refreshers can help reinforce learning and maintain high standards of practice. Employing enhanced assessment methods and strategies to increase staff engagement and motivation will likely yield better outcomes. In conclusion, while the current training program at MEO Hospital Lahore did not achieve the desired improvements, the insights gained from this study provide valuable guidance for designing more effective training interventions. By addressing the identified challenges and implementing the recommended strategies, future training efforts can better equip healthcare workers to manage hospital waste safely and efficiently, ultimately contributing to improved public health and environmental safety.

Questionnaire

Section 1: Demographic Information
What is your age?
Under 25
25-34
35-44
45-54
55 and above

What is your gender?
Male
Female
Prefer not to say

What is your role in the hospital?
Doctor
Nurse
Laboratory Technician
Janitorial Staff
Administrative Staff
Other (please specify): _____

How many years have you worked in this hospital?
Less than 1 year
1-3 years
4-6 years
7-10 years
More than 10 years

Section 2: Knowledge and Practices Before Training

How would you rate your knowledge of hospital waste management before the training?
Poor
Fair
Good
Very Good
Excellent

How often did you follow the hospital waste management protocols before the training?
Never
Rarely
Sometimes
Often
Always

Were you aware of the different categories of hospital waste (e.g., general waste, infectious waste, hazardous waste) before the training?
Yes
No

Did you use personal protective equipment (PPE) regularly when handling hospital waste before the training?
Yes
No

How confident were you in your ability to manage hospital waste safely before the training?
Not confident
Slightly confident
Moderately confident
Very confident
Extremely confident

Section 3: Training Experience
How satisfied were you with the content of the training program?
Very Dissatisfied
Dissatisfied
Neutral
Satisfied
Very Satisfied

How relevant was the training to your daily responsibilities?
Not relevant
Slightly relevant
Moderately relevant
Very relevant
Extremely relevant

Did the training improve your understanding of hospital waste management?
Not at all
A little
Somewhat
A lot
Completely

Were the training materials (e.g., presentations, handouts) clear and easy to understand?
Strongly Disagree
Disagree
Neutral
Agree
Strongly Agree

How likely are you to apply the knowledge gained from the training in your work?
Not likely
Slightly likely
Moderately likely
Very likely
Extremely likely

Section 4: Knowledge and Practices After Training
How would you rate your knowledge of hospital waste management after the training?
Poor
Fair
Good
Very Good
Excellent

How often do you follow the hospital waste management protocols after the training?
Never
Rarely
Sometimes
Often
Always

Are you now aware of the different categories of hospital waste (e.g., general waste, infectious waste, hazardous waste)?
Yes
No

Do you use personal protective equipment (PPE) regularly when handling hospital waste after the training?
Yes
No

How confident are you in your ability to manage hospital waste safely after the training?
Not confident
Slightly confident
Moderately confident
Very confident
Extremely confident

Section 5: Overall Impact of Training
To what extent has the training improved your hospital's overall waste management practices?
Not at all
A little
Somewhat
A lot

Completely

Have you noticed any reduction in hospital waste-related incidents (e.g., needle stick injuries, improper waste disposal) after the training?

Yes

No

How would you rate the overall effectiveness of the training program?

Very Ineffective

Ineffective

Neutral

Effective

Very Effective

Would you recommend this training to other hospital staff?

Yes

No

Please provide any additional comments or suggestions for improving the training program:

REFERENCES

1. Shivashankarappa D, Athani SB, Seema P, Hombaiah C, Padmavathy M, Sharath B. A study on the effectiveness of training programs in improving biomedical waste handling in a tertiary care hospital, Bengaluru: A pre-post study. Clinical Epidemiology and Global Health. 2024;26:101526.
2. Mishra PK, Dwivedi S, Shrestha S, Tiwari S. Assess the effectiveness of structured teaching program on bio medical waste management among staff nurses working in scpm multi-speciality hospital Gonda (Uttar Pradesh). Hindu.19:63.3.
3. Conti A, Viottini E, Comoretto RI, Piovan C, Martin B, Albanesi B, et al. The Effectiveness of Educational Interventions in Improving Waste Management Knowledge, Attitudes, and Practices among Healthcare Workers: A Systematic Review and Meta-Analysis. Sustainability. 2024;16(9):3513.
4. Gholap MGH, Chandekar P. EFFECTIVENESS OF SELF-INSTRUCTIONAL MODULE ON KNOWLEDGE AND PRACTICES REGARDING BIOMEDICAL WASTE MANAGEMENT AMONG LAB TECHNICIANS.
5. Hikmah Z, Yulia R, Wijono H, Herawati F. Healthcare collaboration intervention: Pre-post study. Pharmacy Education. 2024;24(3):388-94.
6. Bingöl Ü, Kutlu A. The effect of pre and post Covıd-19 hazard and risk management of nurses on performance evaluation. Work. 2024(Preprint):1-16.
7. Tshitangano TG. Case Study Protocol to Evaluate the Impact of Training Intervention on Cleaners' Knowledge Level, Perceptions and Practices regarding Correct Cleaning Techniques at Selected Care Facilities in Limpopo Province, South Africa. Nursing Reports. 2024;14(1):328-39.
8. Saad HA, Abdallah ZA, Khamis EAR, Ali EA, Bayoumy SA. Effect of Educational Program on Nurses' Perception Regarding Green Hospital and Attitude towards Patient Safety Guidelines. Assiut Scientific Nursing Journal. 2024;12(41):202-14.
9. Maamri H, Ayed HB, Hmida MB, Trigui M, Baklouti M, Jemaa MB, et al. Effectiveness of a training program on health-care professionals' knowledge and practices regarding thermo-sensitive reusable medical devices disinfection: A quasi-experimental study. Infection, Disease & Health. 2024;29(1):1-7.
10. Noonan M, Brown M, Gibbons M, Tuohy T, Johnson K, Bradshaw C, et al. Evaluation of the effectiveness of a video-based educational intervention on perinatal mental health related stigma reduction strategies for healthcare professionals: a single group pre-test-post-test pilot study. Midwifery. 2024:104089.

11. Topçu S, Ardahan M. Evaluation of occupational health and safety training for nursing students. Innowacje w Pielęgniarstwie i Naukach o Zdrowiu. 2024;9(1):7-25.
12. Kulkarni SM, Sirsath MA. A Study to Evaluate the Effectiveness of a Demonstration on Practices Regarding Domestic Waste Management Amon Housewives Staying, in Sangli, Miraj, Kupwad Areas. 2024.
13. Lee S-H, Yang I-S. Empowering hospital-associated infection prevention and control: a quasi-experimental study on the effect of scenario-based simulation training. Nurse Education in Practice. 2024;76:103936.
14. Lin C-H, Tzeng W-C, Chiang L-C, Lu M-C, Lee M-S, Chiang S-L. Effectiveness of a Structured Disaster Management Training Program on Nurses' Disaster Readiness for Response to Emergencies and Disasters: A Randomized Controlled Trial. Journal of Nursing Management. 2024;2024(1):5551894.
15. Shivashankarappa D, Athani SB, Seema P, Hombaiah C, Padmavathy M, Sharath B. Clinical Epidemiology and Global Health.
16. Gajbhiye S, Karale K, Deshmukh A. Impact of Comprehensive Training for Enhancing Competency in HIV Testing Laboratory: Our Experience. 2024.
17. Qtait M. Effectiveness of Time Management Training Program on Patient Quality of Care Performed by Nurses Working in Intensive Care Units in the West Bank Government Hospitals: AAUP; 2024.
18. Huang J, Liu X, Xu J, Ren L, Liu L, Jiang T, et al. Examining the effect of training with a teaching for understanding framework on intravenous therapy administration's knowledge, performance, and satisfaction of nursing students: a non-randomized controlled study. BMC nursing. 2024;23(1):104.
19. Elliza M, Putri ZM, Ananda Y. Effectiveness of Paul Model Critical Thinking Training on Nurses' Knowledge and Skills: A Quasi-Experimental Study in a Type C Hospital. Viva Medika: Jurnal Kesehatan, Kebidanan dan Keperawatan. 2024;17(2):255-64.
20. Seifi A, Mohammadnejad E, Miladi R. How Effective Are In-Hospital Training Workshops on Infection Control for Physicians? First Report in Iran. Journal of Kermanshah University of Medical Sciences. 2024;28(2).
21. Săratilă I, Romancenco A, Spinei L. Evaluating the efficacy of simulation-based training on clinical competency transfer. One Health and Risk Management. 2024(3):21-32.
22. Faisal-E-Alam M. EFFECT OF TRAINING PROGRAMS ON TRAINEES'LEARNING. Bangladesh Journal of Multidisciplinary Scientific Research. 2024;9(1):25-31.
23. Shawah'en AA, Al-Akash HY, Massadeh R, Shajrawi A, Maabreh R, Assaf E, et al. TRIAGE KNOWLEDGE LEVEL AND SKILLS AMONG EMERGENCY NURSES IN JORDAN: A QUASI-EXPERIMENTAL STUDY.
24. Abd El Hamid FM, Ahmed EH, Basuony NAEM, Amer WM. Effect of Massive Online Courses on Improving Nurses' Performance Regarding Infection Prevention Measures. Zagazig Nursing Journal. 2024;20(1):40-60.
25. Kamal Mohamed M, Elsayed Mohammed Khalil N, Salama Abdelaziz F. The Effect of Sustainable Development Educational Program on Nursing Interns Students' Knowledge, Behavior and Attitude. Egyptian Journal of Health Care. 2024;15(2):1214-30.
26. Mohamed Ahmed Maiz A, Mohamed Rashed N, Awad Shetaway G. Effect of instructional Guidelines regarding Climate Change on Nurses' knowledge and its Relation to Environmental Sustainability Practice. Egyptian Journal of Health Care. 2024;15(2):534-47.