Research Paper: The Comparison of Lecture-Based and Web-Based Education on Nursing Students' Learning in the Management of Radiation Injuries

Amir Hosein Pishgooie[1], Shahla Aliyari[2*], Faeze Baniyaghoobi[3], Simintaj Sharififar[4], Ali Dadgari[5]

1. Department of Critical Care Nursing, Faculty of Nursing, AJA University of Medical Sciences, Tehran, Iran.
2. Department of Maternal Newborn Health, Faculty of Nursing, AJA University of Medical Sciences, Tehran, Iran.
3. Department of Military Nursing, Faculty of Nursing, AJA University of Medical Sciences, Tehran, Iran.
4. Department of Health in Disasters and Emergencies, Faculty of Nursing, AJA University of Medical Sciences, Tehran, Iran.
5. School of Nursing and Midwifery, Shahroud University of Medical Siences, Shahroud, Iran.

ABSTRACT

Background: Extensive application of radioactive materials to medical and military purposes justifies the necessity of training military nurse students regarding the management of radiation injury. The current study aimed at comparing the effect of two methods (lecture and web-based) of training on the management of radiation-injured patients among military nurse students from 2013 to 2014.

Materials and Methods: The current semi-experimental study was conducted on 60 military nursing students in two military nursing schools in Tehran, Iran selected purposively. Subjects of the study were divided into two groups of 30 as lecture and web-based teaching. The effect of education was measured on three levels of knowledge, comprehension, and application; before, immediately after, and four weeks after completion of teaching. The data were analyzed with SPSS software version 21, using Repeated Measures (RM)-ANOVA and t-test.

Results: Mean and standard deviation of scores in all learning levels (knowledge, comprehension, and application) in both groups had a significant difference between before and after the intervention (P<0.001). No significant difference was observed in the total mean scores of the two groups before intervention. In the post-test, immediately after training, mean scores of the web-based group had a greater increase, but no significant difference was observed (P=0.12). In the retention stage (four weeks after training), it was observed that the lecture-based method was more effective (P=0.01).

Conclusion: According to the obtained results, learning increased in both methods . Therefore, it is recommended to use the combined teaching method to educate nursing students.

* Corresponding Author:
Shahla Aliyari, PhD.
Address: Department of Maternal Newborn Health, Faculty of Nursing, AJA University of Medical Sciences, Tehran, Iran.
E-mail: sh.aliyari@ajaums.ac.ir

1. Introduction

In spite of the rareness, radiation disasters can be regarded as random or non-random. Such disasters may be due to experiments, use of radioactive substances in industries, application in hospitals, terrorist attacks, and wars. The International Atomic Energy Agency (IAEA) stated that radiation incidents can have sequential and specific impacts on individuals, environment, and facilities [1]. Despite adopting the most stringent security measures suggested by the IAEA in compliance with the standards, a large number of radiation disasters occurred during the past years. The Chernobyl Disaster (1986) and the Fukushima Disaster (2011) were among the major disasters with level 7 according to the IAEA [2].

In the earthquake of Japan on 11 March 2011 and consequently, the tsunami killing 19,000 people, about 16,000 people were forced to leave their homes due to the destruction of Daichi Nuclear Power Plant in Fukushima and radioactive leakage. The exposure to internal and external radiation had severe impacts on agricultural and marine aquatic environments [3-5]. Radiation disasters occurring in any place and any form require the presence of trained people and medical teams at the accident site and the measures of restoration are highly significant to save the lives of the injured ones [6, 7].

In the absence of trained and skilled healthcare workers in the management of radiation disasters, the casualty rate increases significantly. For this reason, IAEA has repeatedly called all countries with nuclear technology to prepare guidelines and measures to have sufficient preparation to deal with nuclear incidents and train their own people [1]. Nurses, as the largest health group, are the key elements in the management of radiation disasters, while studies show that they are not often prepared to deal with such disasters and do not receive adequate theoretical and practical training [6, 8].

Results of a cross sectional study indicated that nurses' general knowledge about the crisis was poor (mean: 1.79 out of 7) [9]. Sato et al. (2015) indicated that 44.6% of nurses were planning to leave their workplace during the Fukushima Nuclear Power Plant accident. One of the effective factors in this decision was the anxiety about living in the city after the disaster and the health effects of radiation on children. As a conclusion, it is of great importance for nurses to acquire accurate information about the effects of radiation on health [10]. Accordingly, nursing students' education regarding the radiation injuries is insufficient and their preparation is critical in this regard.

Education is a socio-cultural and dynamic process and using an appropriate teaching method can play a vital role in ensuring better learning and overall persistence to the learner [11, 12]. Education, as a significant part of the preparation process, can facilitate and accelerate learning [13]. Education can play a key role in preparing people for disasters, while having dynamic training methods in the health system can prepare nurses to deal with disasters and minimize the resulting casualties [14]. Nowadays, the application of modern methods of education is inevitable [15]. Different methods of education are evaluated in several studies and each study makes some suggestions to use the method of education [14, 16-22].

Lecture-based education is one of the methods of face-to-face teaching with a long history widely used nowadays [19]. This is a face-to-face teaching technique with direct relationship between the teacher and the student [23] still used as a cheap and effective method at universities to teach a large number of learners simultaneously. Thus, the interaction between learners and teachers is established to some extent [18, 24, 25]. The greatest advantages of this method are the teaching of content by experienced and skilled professors, making the learners eager to learn, motivating them constantly, and facilitating the learning process [26]. In spite of the advantages of this method, some disadvantages of lecturing are also mentioned in some studies. One of the disadvantages of this method is the inactive transfer of information to the universal [27]. Sometimes this method alone cannot achieve the desired learning results and finally the result in many cases depends on the ability and effort of the learners [26].

Virtual education, i.e. web-based education, is the other teaching/learning technique. Due to the shortage of nursing trainers and the inadequate time of nurses to attend lecture-based training courses, there is an increase in the tendency toward virtual courses such as web-based education [18]. Different studies mentioned the advantages of web-based education than lecture-based education including flexibility and eliminating unnecessary and costly traffic, using the program at the time of need, increasing the speed of learning, attracting more attention to the audience, update contents, the unique experience of simultaneous use of visual, audio, and textual teaching methods, the possibility of private tutoring, lack of boundaries and scope, the absence of multiple problems regarding the presence of experienced and expert professors, and the possibility of innovation or exploratory learning [16-18, 28].

72

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.

Despite the above mentioned advantages, the web-based education can have some disadvantages. The first problem, as compared with lecture-based education, is the lack of human contact, which can significantly affect the learning process [18, 29]. Another disadvantage is inequality in technology, meaning that not all students can get modern computers with multimedia facilities and they are not familiar with computers, internet, and software programs [28]. Although some studies acknowledged the effectiveness of modern teaching methods such as web-based education [28-30], some studies indicated different findings in this regard and mentioned no significant difference between the two lecture and web-based methods [22, 31].

Training of students in the medical group, especially nursing as the largest care provider group, is a necessity in order to prepare for the response to disasters and crises. On the other hand, it is necessary to provide this preparation in the most effective way [16]. E-learning development can be one of the choices. AJA University of Medical Sciences designed a training program called "Military Nursing" for nursing students in pursuit of its mission and goal, and one part of this education is on radiation. Such extra hours are imposed to the students by the ministry of health, which can sometimes cause dissatisfaction. Using web-based education can have the advantage of studying the content without attending classes, while having mid-term holidays or other occasions. The current study aimed at comparing two methods of lecture-based and web-based education on nursing students' learning.

2. Materials and Methods

The current semi-experimental study was conducted on two groups of subjects (before and after education) from 2013 to 2014. The population included the students in two faculties of nursing in Tehran. Due to the launch of a virtual education system in one of these colleges and the need to examine its effectiveness, the choice of colleges was based on the goal. In order to prevent the information exchange, the each of the lecture-based and web-based methods was used in one of the colleges. The sample selection in each college was conducted by simple random sampling among the students.

The inclusion criteria were non-completion of the military nursing unit, basic computer and internet application literacy for the intervention group, a score of less than 60% in the pre-test, and willingness to participate in the project. The exclusion criteria were the lack of participation in one of the training sessions, the failure to refer to the introduced website twice, the lack of willingness to continue cooperation, and incomplete completion of the questionnaires. The sample size for each group was calculated using Altman's Nomogram and calculation of β=80, α=5%, and d=2.4, and the results of the same study [13] were estimated to be 28. With the probability of 10% dropouts, 30 subjects were considered for each group (i.e. a total of 60 subjects). The number of subjects included in each group was 30, and there was no dropout during the study.

Initially, a pre-test was performed for both groups (lecture and web-based), and the questionnaire included 30 standard questions related to cognitive domains (knowledge, understanding, and application). Then, training was performed for the lecture group using lectures, question and answer, image, and PowerPoint methods in two 2-hour sessions in two weeks (two hours a week) and the second group was trained using the pages loaded on the internet with the same content. Training in this group included texts, slides and animations, and questions and answers with links to complete the references, without any restrictions on location for two weeks at the same time as lecture-based training. Each student in the web-based group was given a separate and confidential user name and password. The entrance and exit and the number of visit by each student were controlled. After the end of the intervention, the post-test was administered using the same pre-test questions in written form with a four-week interval.

The content validity of the education was evaluated qualitatively by a survey of 10 faculty members and experts in the management of radiation-injured patients. According to the recommendations of the faculty members and experts, the content of training was reviewed several times and eventually edited and organized. The developed content entitled "Guidelines for the Management of Radiation-injured Patients" had two chapters. The list of titles in the first chapter included introduction, history, definition of terms, definition of types of beams, dosimeters, and various types of radiation disasters, and those of the second chapter included the definition of radiation disaster, radiation types, acute radiation syndrome, management of radiation-injured patients and nursing care.

A researcher-made questionnaire containing 30 multiple-choice questions was used in the current study in both groups, which measured the cognitive domain of students in three levels of knowledge, comprehension, and application. There was only one correct answer in each question, and the total score of the questionnaire

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.

73

was 30. Questions 1 to 13 were on the level of knowledge (13 points), 14-22 comprehension (9 points), and 23-30 application (8 points).

After designing a questionnaire based on the resources, the content validity of the questionnaire was determined by 10 faculty members with sufficient skills in radiation disasters and assessment, and after applying their comments and suggestions, necessary corrections were made to the test questions. The initial questionnaire had 37 multiple-choice items. According to experts, seven questions were removed and some questions were modified in accordance with Millmen's 14 principles. In order to determine the reliability of the questionnaire, 10 nursing students who completed the military nursing course were selected and the test was administered to them. Two weeks later, the same questionnaire was given to the same individuals and its reliability was calculated and validated using the Pearson correlation coefficient (r=80%). The internal consistency of the questionnaire was evaluated using Cronbach's alpha (α=76%).

The data were analyzed with SPSS V. 21 software using descriptive statistics (mean and standard deviation) to examine the participants' characteristics, and independent t-test, the Fisher exact test, ANOVA, the Kolmogorov-Smirnov test, and Pearson correlation coefficient. Independent t-test was used to compare the means

in both groups and RM-ANOVA was used to compare the means before and after the retention in each group.

The current study protocol was approved by Ethics Committee of AJA University of Medical Sciences (NO. 9318). Also, the outlined ethical principles in Declaration of Helsinki were observed [32]. The observed ethical considerations included obtaining the informed consent, subjects' justification about the study and its objectives, respect to privacy principle, and confidentiality of information, subjects' freedom to withdraw from the study at any time, and respect to the rights of authors in the use of electronic and printed references.

3. Results

The demographic characteristics of the studied units are presented in Table 1. There was no significant difference between the two groups in terms of demographic variables (P>0.05). The mean score of the two groups is compared in Table 2. Comparison of the total scores of the two groups showed no significant difference in the pre-test and post-test stages (P>0.05). However, the mean score of the lecture-based group was significantly higher than that of the web-based group at the retention stage (P<0.05). The mean of total post-test scores increased in both groups that was higher in the web-based group, but did not show significant differences. During

Table 1. The demographic characteristics of the units under study

Variable		Web-Based Group	Lecture-Based Group	Test Type P
Gender	Female Number (%)	4(13.3)	7(23.3)	Fisher Exact Test
	Male Number (%)	26(86.7)	23(76.7)	P=0.31
Stay in the hostel	Yes	29(96.7)	30(100)	Fisher Exact Test P=0.19
Marital status	Married	2(6.7)	4(13.3)	Fisher Exact Test
	Single	28(93.3)	26(86.7)	P=0.49
Clinical experience	Yes	5(16.7)	2(6.7)	Fisher Exact Test
	No	25(83.3)	28(93.3)	P=0.22
Age, yr	Mean±SD	21.37±1.033	12.13±1.008	t=-0.88 P=0.22 df=58

Table 2. Comparing the mean scores of the two lecture-based and web-based groups at each level of the test

Independent T-Test	Group	Lecture	Web-Based	Sig. (%)
	Pre-test	7.13±2.649	7.83±2.561	30
Total mean of scores	Post-test	17.23±3.370	18.57±3.308	12
	Retention	12.30±3.395	10.40±2.568	1*
Significance level of RM ANOVA (total scores in three stages)		F=145.878 P<0.001	F=125.61 P<0.001	

* P<0.05 was considered as the level of significance.

Table 3. Comparing the mean scores of the two groups at different levels of learning at each level of the test

Learning Stage	Group	Lecture-Based	Web-Based	Sig.
	Pre-test	3.40±1.453	3.67±2.123	0.57
Knowledge	Post-test	8.77±2.445	8.75±2.329	0.74
	Retention	6.03±2.109	3.93±1.874	<0.001*
	Pre-test	2.13±1.196	2.63±1.402	0.14
Comprehension	Post-test	4.47±1.279	5.60±1.567	0.003*
	Retention	3.33±1.605	3.20±1.518	1.74
	Pre-test	1.60±1.192	1.53±1.106	0.82
Application	Post-test	4±1.339	4.40±1.192	0.22
	Retention	2.93±1.285	3.27±1.081	0.28

* P<0.05 was considered as the level of significance.

the retention stage, the total scores had a descending trend, while it was maintained at a higher level in the lecture-based group. Intragroup comparisons showed that the mean of total learning scores in each group was significantly different in the three stages of pre-test, post-test, and retention (P<0.001).

The mean scores of the two groups in the levels of knowledge, comprehension, and application at each stage of the test are compared in Table 3. Findings showed that the scores of knowledge level during the retention stage were significantly higher in the lecture-based group than the web-based group (P<0.05). However, at the comprehension level, the mean scores of the web-based group were significantly higher than those of the lecture-based group (P<0.05). The mean scores of application level were not significantly different between the two groups (P>0.05).

4. Discussion

In general, cognitive learning levels were low in the two groups before intervention, which was unexpected considering the need for education in this field. In the post-test scores, the mean of the total score in the lecture-based and the web-based groups after the training had an ascending trend and the scores in the web-based group were higher than those of the lecture-based group, while no significant difference was observed between the two groups. In terms of learning levels, the mean scores of retention at the knowledge level in the lecture-based group and the mean post-test scores at the comprehension level in the web-based group were significantly higher.

In this regard, the results of study by Chao showed no significant difference between the participants' post-test scores in the two groups of web-based and lecture-based, which was consistent with the results of the current study. The results of studies by Mata and Gerdprasert were similar to those of the current study. However, in

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.

75

both studies the scores were compared only after the intervention, while in the current study the scores were compared four weeks after the intervention in order to check the retention, which was one of the strengths of the current study.

Ebadi et al. (2010) in a semi-experimental study compared the effect of traditional training with virtual training on clinical skills, and their results showed that both methods had the same effect on the improvement of nurses' functional skills [25]. Therefore, both methods can be used to increase the level of learning. Öztürk explored the impact of web-based and lecture-based education on the knowledge and skills of nursing students in Turkey.

The mean scores of the web-based group at the knowledge level after intervention were higher than those of the lecture-based group, but there was no significant difference, which was consistent with the current study findings. However, Öztürk did not conduct the pre-test in his study, which was one of its weaknesses, and made decisions on the basis of the mean scores obtained after the intervention. Although students had access to educational content at any time and place and could receive instructions according to their desires and speed of learning in the web-based education, in the current study, similar to that of Öztürk, the mean total post-test scores were not significantly different, which was perhaps due to the limits of interaction between the teacher and the student in the web-based education.

The students in the web-based group had no opportunity to discuss educational content or receive feedback from their teacher, while in traditional education there was an opportunity for question and answer and two-way interaction during the education. In a clinical trial aimed at comparing nursing care education in aerial relief and transportation by two methods of lecture-based and web-based conducted by Farshi et al. (2012) the results showed no significant difference between the two groups in the post-test stage, consistent with the results of current study. However, in the process of retention, the effectiveness of the software method [33] was specified, while in the current study, the average score of the lecture-based group was higher. Perhaps the reason for this difference was due to the type of training, since in the study by Farshi the electronic content was provided to the participants, but in the current study, participants should study the content through the web.

Gerdprasert compared web-based and lecture-based education in pregnancy care on nurses in Thailand and

concluded that the mean scores of students in knowledge and skills in the web-based group were significantly higher than those of the lecture-based group as contrary to the results obtained in the current study. Perhaps one of the reasons for this difference was due to the study setting and the access of participants to the network facilities. Another reason was the difference between the content being taught and the use of simulation films in the study. On the other hand, the evaluation of scores was performed only at a post-intervention level in the above-mentioned study.

In the current study, the mean scores before and after intervention in each of the groups (lecture-based and web-based) showed that in both groups, the post-intervention scores increased significantly. Similar results were observed in the review of all available studies [17, 25, 29, 30, 34], but in the previous studies, except for the study by Farshi et al. (2012), the mean scores were evaluated only at the post-intervention stage [33]. However, in the current study, the scores were evaluated four weeks after the intervention in order to evaluate the retention, which was one of the advantages of the study. On the other hand, no study investigated the levels of learning except for the one by Farshi et al. (2012) which was another strength of the current study [33].

The higher level of comprehension at the post-test stage in the web-based group was compared to that of the lecture-based group, and the results of some published studies [30] confirmed that using web-based education may be more effective to train the skills of higher levels of cognitive domains, especially in the field of medical sciences. On the other hand, the knowledge level was lower at the retention stage in the web-based group than the lecture-based group; it required more facilities in the web-based education such as the employment of all training patterns during training including videos, audio, and animation. On the other hand, using different motivational approaches to persuade learners to go to educational sites was confirmed. In general, both lecture-based and web-based educations could improve all areas of cognitive learning. The obtained results and the review of various studies suggested that web-based learning, when combined with lecture and face-to-face education, results in more effective learning.

Based on the studies and investigations conducted by the researchers on the subject of the study, the definite superiority of a particular educational method is not confirmed in the reviewed studies, as concluded in the present study. However, due to the lack of professional human resources in education and the provision of dif-

76

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.

ferent training content by trainer, and with regard to saving time and expenses, it is recommended that new educational methods be combined, especially the web-based education, with lecture-based education.

5. Conclusion

Based on the current study results, it seems that both methods increased learning. The lecture-based and web-based educations had the greatest impact respectively on the levels of knowledge and comprehension. Therefore, it is suggested that the learning methods be applied simultaneously to train the students.

Ethical Considerations

Compliance with ethical guidelines

The current study protocol was approved by Ethics Committee of AJA University of Medical Sciences (NO. 9318). Also, the outlined ethical principles in Declaration of Helsinki were observed. The observed ethical considerations included obtaining the informed consent, subjects' justification about the study and its objectives, respect to privacy principle, and confidentiality of information, subjects' freedom to withdraw from the study at any time, and respect to the rights of authors in the use of electronic and printed references.

Funding

Authors contributions

All of the authors approved the content of the manuscript and contributed significantly to research involved the writing of the manuscript. Study conception and design: Amir Hosein Pishgooie, Shahla Aliyari, Faeze Baniyaghoobi, Simintaj Sharififar, Ali Dadgari; Data collection: Faeze Baniyaghoobi; Analysis: Amir Hosein Pishgooie; Preparing draft of manuscript and making critical revisions to the paper for important intellectual content: Amir Hosein Pishgooie, Simintaj Sharififar, Faeze Baniyaghoobi, Simintaj Sharififar; and English editing: Ali Dadgari.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgements

References

[1] Cerezo L. Radiation accidents and incidents: What do we know about the medical management of acute radiation syndrome. Reports of Practical Oncology and Radiotherapy. 2011; 16(4):119-22. [DOI:10.1016/j.rpor.2011.06.002] [PMID] [PMCID]

[2] Tsujiguchi T, Yamamura H, Kashiwakura I. The medical treatment of radiation exposure and contamination in radiation accidents. Radiation Environment and Medicine. 2017; 6(2):94-103.

[3] Yamaguchi M, Kitamura A, Oda Y, Onishi Y. Predicting the long-term 137 Cs distribution in Fukushima after the Fukushima Dai-ichi nuclear power plant accident: A parameter sensitivity analysis. Journal of Environmental Radioactivity. 2014; 135:135-46. [DOI:10.1016/j.jenvrad.2014.04.011] [PMID]

[4] Boice Jr JD. Radiation epidemiology: A perspective on Fukushima. Journal of Radiological Protection. 2012; 32(1):N33. [DOI:10.1088/0952-4746/32/1/N33] [PMID]

[5] Svendsen ER. A new perspective on radiation risk communication in Fukushima, Japan. Journal of the National Institute of Public Health. 2013; 62(2):196.

[6] Yoshida K. Contributions of nurses after a nuclear accident and a proposal for education in radiation nursing. Radiation Environment and Medicine. 2016; 5(1):59-61.

[7] Rahmati-Najarkolaei F, Moeeni A, Ebadi A, Heidaranlu E. Assessment of a military hospital's disaster preparedness using a health incident command system. Trauma Monthly. 2017; 22(2):e31448. [DOI:10.5812/traumamon.31448]

[8] Veenema TG, Thornton CP. Guidance in managing patients following radiation events. Advanced Emergency Nursing Journal. 2015; 37(3):197-208. [DOI:10.1097/TME.0000000000000058] [PMID]

[9] Sonneborn O, Miller C, Head L, Cross R. Disaster education and preparedness in the acute care setting: A cross sectional survey of operating theatre nurse's disaster knowledge and education. Nurse Education Today. 2018; 65:23-9. [DOI:10.1016/j.nedt.2018.02.015] [PMID]

[10] Sato Y, Hayashida N, Orita M, Urata H, Shinkawa T, Fukushima Y, et al. Factors associated with nurses' intention to leave their jobs after the Fukushima Daiichi Nuclear power plant accident. PLoS One. 2015; 10(3):e0122389. [DOI:10.1371/journal.pone.0122389]

[11] Karatas K, Oral B. Teachers' perceptions on culturally responsiveness in education. Journal of the European Ceramic Society. 2015; 2(2):47-57.

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.

77

[12] Farsi Z, Azarmi S. Effect of roy's adaptation model-guided education on coping strategies of the veterans with lower extremities amputation: A double-blind randomized controlled clinical trial. International Journal of Community Based Nursing and Midwifery. 2016; 4(2):127-136. [PMID] [PMCID]

[13] Shahbazi A, Ghorbanzadeh A, Golvardi Yazdi M, Azad M, Sharifi A. [Comparing the effect of lecture and rescue training methods with the war maneuvers on the public aid preparedness in the personnel of the navy's military barracks (Persian)]. Journal of Military Medicine. 2016; 17(4):291-7.

[14] Daneshmandi M, Asgari A, Tadrisi SD, Ebadi A, Mokhtari Nouri J. [Effect of self- and buddy-aid education by lecture and multimedia software package methods on the knowledge level of personnel (Persian)]. Journal of Military Medicine. 2011; 13(1):7-10.

[15] Council of Deans of Health and the Higher Education Academy. Innovation in teaching and learning in health higher education. London: The Higher Education Academy; 2015.

[16] McCutcheon K, Lohan M, Traynor M, Martin D. A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. Journal of Advanced Nursing. 2015; 71(2):255-70. [DOI:10.1111/jan.12509] [PMID]

[17] Öztürk D, Dinç L. Effect of web-based education on nursing students' urinary catheterization knowledge and skills. Nurse Education Today. 2014; 34(5):802-8. [DOI:10.1016/j.nedt.2013.08.007] [PMID]

[18] Du S, Liu Z, Liu S, Yin H, Xu G, Zhang H, et al. Web-based distance learning for nurse education: A systematic review. International Nursing Review. 2013; 60(2):167-77. [DOI:10.1111/inr.12015] [PMID]

[19] Maloney S, Haas R, Keating JL, Molloy E, Jolly B, Sims J, et al. Breakeven, cost benefit, cost effectiveness, and willingness to pay for web-based versus face-to-face education delivery for health professionals. Journal of Medical Internet Research. 2012; 14(2):e47. [DOI:10.2196/jmir.2040] [PMID] [PMCID]

[20] Sanaeinasab H, Tavakoli R, Karimizarchi A, Amini ZH, Farokhian A, Najarkolaei FR. The effectiveness of education using the health belief model in preventing osteoporosis among female students. Eastern Mediterranean Health Journal. 2014; 19(Suppl 3):S38-44. [DOI:10.26719/2013.19.Supp3.S38] [PMID]

[21] Tavakoli HR, Dini-Talatappeh H, Rahmati-Najarkolaei F, Fesharaki MG. Efficacy of HBM-based dietary education intervention on knowledge, attitude, and behavior in medical students. Iranian Red Crescent Medical Journal. 2016; 18(11):1-8. [DOI:10.5812/ircmj.23584] [PMID] [PMCID]

[22] Dadgari F, Hoseini S, Aliyari S, Masoudi S. The effect of sustained nursing consulting via telephone (Tele nursing) on the quality of life in hypertensive patients. Applied Nursing Research. 2017; (35):106-11. [DOI:10.1016/j.apnr.2017.02.023] [PMID]

[23] Mata CA, Ota LH, Suzuki I, Telles A, Miotto A, Leão LE. Web-based versus traditional lecture: Are they equally effective as a flexible bronchoscopy teaching method. Interactive Cardio Vascular and Thoracic Surgery. 2012; 14(1):38-40. [DOI:10.1093/icvts/ivr030] [PMID] [PMCID]

[24] Bloomfield J, Roberts J, While A. The effect of computer-assisted learning versus conventional teaching methods on the acquisition and retention of handwashing theory and skills in pre-qualification nursing students: A randomised controlled trial. International Journal of Nursing Studies. 2010; 47(3):287-94. [DOI:10.1016/j.ijnurstu.2009.08.003] [PMID]

[25] Ebadi A, Yousefi Goshtasb Sh, Khaghanizadeh M, Hosseini SMJ, Raeisifar A, Masoum M, et al. [Comparison the effect of conventional and distance training on nurses' clinical skills (Persian)]. Journal of Military Medicine. 2010; 12(2):71-74.

[26] Pale P. Intrinsic deficiencies of lectures as a teaching method. Collegium Antropologicum. 2013; 37(2):551-9. [PMID]

[27] Wolff M, Wagner MJ, Poznanski S, Schiller J, Santen S. Not another boring lecture: Engaging learners with active learning techniques. Journal of Emergency Medicine. 2015; 48(1):85-93. [DOI:10.1016/j.jemermed.2014.09.010] [PMID]

[28] Liaw SY, Wong LF, Lim EYP, Ang SBL, Mujumdar S, Ho JTY, et al. Effectiveness of a web-based simulation in improving nurses' workplace practice with deteriorating ward patients: A pre- and post-intervention study. Journal of Medical Internet Research. 2016; 18(2):e37. [DOI:10.2196/jmir.5294] [PMID] [PMCID]

[29] Gerdprasert S, Pruksacheva T, Panijpan B, Ruenwongsa P. An interactive web-based learning unit to facilitate and improve intrapartum nursing care of nursing students. Nurse Education Today. 2011; 31(5):531-5. [DOI:10.1016/j.nedt.2010.10.008] [PMID]

[30] Baniyaghoobi F, Aliyari SH, Sharififar S, Pishgooei AH. [Effect of radiation injured management education by web-based method on cognition learning levels of nursing students (Persian)]. Nurse and Physician Within War. 2015; 2(3):72-80.

[31] Gerdprasert S, Pruksacheva T, Panijpan B, Ruenwongsa P. Development of a web-based learning medium on mechanism of labour for nursing students. Nurse Education Today. 2010; 30(5):464-9. [DOI:10.1016/j.nedt.2009.10.007] [PMID]

[32] The World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects [Internet]. 2018 [Updated 2018 July 9]. Available from: https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/

[33] Farshi M, Babatabar Darzi H, Mahmoudi H, Mokhtari Nouri J. [Comparison of nursing care learning in air evacuation and transport by lecture and e-learning methods (Persian)]. Journal of Military Medicine. 2012; 14(1):27-31.

[34] Chao SH, Brett B, Wiecha JM, Norton LE, Levine SA. Use of an online curriculum to teach delirium to fourth-year medical students: A comparison with lecture format. Journal of the American Geriatrics Society. 2012; 60(7):1328-32. [DOI:10.1111/j.1532-5415.2012.04035.x] [PMID]

78

Pishgooie AH, et al. Radiation Injured Management Training. HDQ. 2019; 4(2):71-78.