

## RESEARCH ARTICLE

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# Effective Method for Nurses Education: Gaming versus Lecturing

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### Abstract

**Introduction:** There were many educational methods used in teaching nursing students and nursing staff, such as traditional lecturing and game-based learning; there was no consensus in the literature on the best teaching method. The study aimed to investigate the effectiveness of game-based learning versus traditional lecturing on the knowledge acquisition of newly employed nurses. **Materials and Methods:** Pretest and posttest quasi-experimental was used to conduct this study in an oncology center located in Amman, Jordan. 156 newly employed nurses participated in the study, 70 in the lecture group, and 86 in the game group, nurses from both groups were assigned to each learning group according to their employment time during orientation period (first month of employment). For lecture group, new employed nurses were assigned in two different times. For the game group, new employed nurses were assigned in four different times. We use an instrument composed of fifteen questions measuring nurse's knowledge acquisition regarding pressure injury, this instrument was used as pretest and posttest for both learning groups. **Results:** There was a significant difference between pretest and posttest scores in the lecture group ( $P < 0.001$ ), and there was a significant mean difference between pretest and posttest scores in the game group ( $P < 0.001$ ), which indicates that both educational methods had a positive impact on nurse's knowledge. However, there was a significant mean difference between the posttest scores between game group and lecture group to the favor of the lecture group (mean=8.17, 9.00 respectively,  $P = 0.003$ ). **Discussion:** The current study showed that lecture was more effective than the game in knowledge acquisition. More studies with a larger sample are needed to evaluate the game's effectiveness as an educational method versus lecture.

**Keywords:** Teaching strategies- education- nurses- educational lecture- traditional lecturing- game

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### Introduction

Many teaching methods are used in nursing education, either on undergraduate or postgraduate. The most popular method was the traditional lecturing method, in which the educators presented the scientific material by slideshow. In this method, educators usually present information without input from learners, making them concentrate less. However, it is a time-saving method, and it provides a large amount of information in a short time and can be presented to a large number of learners. The second important method in nursing education was experiential learning which is based on the works of Dewey, Piaget, and Lewine. Kolb defined experiential learning as the process whereby knowledge is created through experience transformation (Kolb, 1984).

Experiential learning has many types of educational methods such as games, simulation, and video learning. But these methods face many challenges such as insufficient time to experience every single skill or situation, the time required to prepare for experiential

learning sessions, cost, lack of clinical placement or labs, insufficient equipment, lack of faculty experience and knowledge, which make faculty reluctant to change the method of teaching (Murray, 2018). A review study by Wang et al. (2016) revealed that the use of game in the education of health care professionals will enhance their knowledge; thus to achieve this goal, many types of game might be used such as board games, crossword puzzles, game show, card game, pen, and pencils game, computer-based games, and role-playing. However, this field was a growing field; need more studies to develop, evaluate, and distribute game empirically.

The educational card game was one of the game methods used in nursing education, which depends on teaching through the educational card that contains a question with answers. Each card has one question that will be distributed to the learners who were divided into teams. They have an opportunity to answer questions in an orderly manner. Kordaki (2015) pointed the specific modeling methodology for the creation of an educational card game. This methodology is based on three models:

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the model of subject matter, the learners' model, and the learning model or strategy. These models contain many requirements for playing the game, such as preparing the material in questions, rules for session conducting, the Teacher's role, the learner in the game, and how to conduct the game.

In order to conduct the game-based session, the learners should be divided into teams. The team is defined as "a group of people who come together, under shared leadership, mutual responsibility, and conscious authority, to achieve agreed-on goals in mutually effective fashion" (Sugar & Takacs, 2000. P 17). The team usually includes three to eight people. If fewer than three, it is hard to say that you even have a team. However, if there are more than eight, we may have two teams (Sugar & Takacs, 2000). Moreover, learners in each team should select a leader based on what they agreed on. The purpose of the team is education, not entertainment. Each team will be given a name, sit on a separate table, discuss the questions given by the Teacher, and answer these questions within a specific time after agreed on by the team leader (Sugar, 1998).

In each game, the following information is important: the purpose, time needed for the game, players, supplies such as place and tables, steps, scoring, facilitator notes, customizing, player instruction, and material provided (Sugar & Takacs, 2000). The teams compete for each other in answering the lecturer's questions, in which group-by-group asked a question in order. The first question should be asked to a group. If they answer correctly, they will award one point, and they could lose a point in case they answer the question incorrectly. The next question would be asked to the next group by order to answer, and so on (Sugar, 1998).

During the session, one more person is needed (as timekeeper) to record the groups' points and control the time to answer each question. After answering each question, very brief comments should be given by the Teacher to focus on knowledge. At the end of the session, closure or debriefing should be conducted. Finally, in this phase, a reward or acknowledgment will be given to the winner group (Sugar, 1998).

There are many formats of the question, which might be used in the card game such as a direct question, Fill-in- the – blanks, multiple-choice, True False, and Partial listing (Steve, 1998). In addition, there are many game accessories, which would be used before, and during the game such as arranging the tables and seats in the proper way, posting the objectives and rules of the game to the player in the game room. The teacher may explain every rule before conducting the game. (Sugar, 1998). There are several benefits of the use of games in medical education (Gleason, 2015). The game might increase the player's attention and improve performance. Moreover, sustained attention and the competition was found to enhance a player's engagement with learning, which means to make learners positive learners and to be involved actively in the educational method; thus, it provides case-based, real-world scenarios.

Moreover, gaming is now considered a viable addition to education and should be evaluated further for its

effectiveness in medical training and, ultimately, patient outcomes. Furthermore, up to the author's knowledge and according to the available literature, no previous studies were comparing the effectiveness of lecturing versus gaming on knowledge acquisition of newly employed nurses.

There were many studies compared between game and other learning methods; most of these studies were evaluated its effect on knowledge acquisition and retaining of nursing students, and some studies on staff nurses and other health care professionals. Moreover, our study could add to the nursing knowledge, nursing education, and nursing research.

Cutumicu et al. (2019) examined the effectiveness of the board game method (RETAIN program) to evaluate the short-term knowledge retention of the neonatal resuscitation, wherein thirty health care providers were nurses, physicians, and respiratory therapists participated in the study. They found that there was a 12% increase in their performance between the pretest and posttest. Moreover, Boada et al. (2015) compared a serious game using LISSA in a randomized controlled study, which was designed to allow the player to save the victim's lives during CPR in an enjoyable way, with self-directed learning that included theory and laboratory. They found that using LISSA was significantly better in knowledge acquisition than other learning methods.

Tan et al. (2017) who compared between effectiveness of game versus didactic lecturing method in providing knowledge and skills to nursing students regarding blood transfusions. They found that there was significant difference between mean scores of the pretest and posttest of the game (experimental) group. In the other hand there was no significant difference between mean scores of the pretest and posttest of the didactic lecturing method. Moreover, they found that the student's confidence and knowledge was improved more than in the didactic method, they concluded that additional scenarios and repetitive exercise could improve clinical performance, they found that games could be more effective when combined with simulation. Furthermore, students had positively evaluated the serious game.

Koivisto et al. (2016) conducted a cross-sectional study, examined the nursing student's experiences of learning clinical reasoning by the educational game method. Students reported that they learned the best of how they use theoretical knowledge effectively while playing, and they learned to apply their previous experiences of patient care while playing. Furthermore, they found that students felt safe to make mistakes while playing in terms of clinical reasoning; because they learned how to collect information and take action. Unfortunately, students were less successful in putting patient care' goals. They found that students who occasionally played or not played were significantly different from those who played digital games frequently. Strickland & Kaylor (2016) examined an educational game designed by the research team; to evaluate the effectiveness of game-based learning on the knowledge of 112 junior nursing students, who enrolled in the fundamental of nursing. This game was composed of ten activities and students were divided into groups

of 5-8 students. Students were rotated through these activities in various locations in the nursing building. The results revealed a positive impact on learner experiential experiences, enhanced learning, increased motivation, and interest when using the game.

Moreover, Aljezawi and Albashtawy (2015) compared the lecture and Jeopardy-style quiz game in terms of knowledge gain among nursing students assigned in two groups. They found an improvement in the posttest scores. The game group was significantly better than the lecture group in the posttest and in the retention test, which was conducted after ten weeks. In addition, they assessed students' satisfaction after the two sessions, which showed that students in the quiz game group were happier with the teaching strategy than the lecture group.

Woolwine et al. (2019) conducted a descriptive correlational study; to examine the effect of gamification on knowledge retention and motivation in the orientation period. The nurses distributed 71 to the traditional lecture and 81 in the gamification session (filled a knowledge quiz and course interest survey). The results revealed a significant difference between pretest scores and posttest scores. In addition, they found positive motivation toward using gamification as a learning method that encourages them to be active learners, which might lead to increased knowledge retention. Moreover, Whittam and Chow (2017) examined the effectiveness of the educational board game method on the knowledge of physicians and nurses regarding the assessment and management of severe burn injuries. They found that games enhanced skills and improved knowledge and stimulated discussion, and provided a relaxed environment.

The study aimed to investigate the effectiveness of game-based learning versus traditional lecturing on the knowledge acquisition of newly employed nurses.

## Materials and Methods

### *Design and Setting*

Quasi-experimental, pretest-posttest design was used to investigate the effect of the game versus lecture on nurses' knowledge acquisition. There were two groups, the first one was the comparison group (lecture), and the second was the experimental group (game). The study was conducted in a specialized cancer center in Jordan.

### *Participants*

The inclusion criteria included newly employed nurses; because there was difficulty in arranging educational methods for large number of currently employed nurses, who worked on rotating shifts and their previous knowledge about pressure injury, which might affect the results of the study. For the newly employed nurses, there was an orientation period, which extend for three month before becoming oncology nurses, which composed of classroom education, and clinical training with senior nurses to get both theoretical and practical training. According to our hospital policy for nurses training, it considered the first month of employment as classroom education, so that in the first month of employment we conduct the educational sessions.

### *Study setting*

A non-profit oncology center located in Amman, The Hashemite Kingdom of Jordan.

### *Intervention and its outcome*

Data were collected between February 2018 and April 2019, participants were new employed nurses who have bachelor of nursing. Before starting data collection, we coordinated with the nursing department, and the education center of the hospital, regarding the estimated number of newly employed nurses to conduct our educational sessions during the orientation program, which extent for three month including theoretical and clinical training before becoming independent nurses.

In February 2018, the first new employed nurses started their orientation program, as new oncology nurses, was 34 nurses, we considered them as the first subgroup of the lecture group (comparison group), so that, the research team of this study decided to start data collection, by providing the educational session, using lecture as educational method, by using the (PowerPoint presentation)®, this educational material was about pressure injury, and, was revised scientifically by the supervisor of wound care team of the hospital.

At the day of the first lecture session, 34 nurses accepted to participate, after providing them, with details about the importance of their participation, their voluntary participation in the study, and withdrawal from the study at any time, but they should attend the educational session; because it is part of their orientation program, they are free not to take the pre and posttest.

After that, nurses were given instructions on how to fill the demographic data, pretest, and posttest, and then a pretest was provided to all participants. After that, the pressure injury lecture (PowerPoint presentation) provided, which was extent for about two hours. At the end of the lecture, a posttest was given to the participants.

After four months, July 2018, the second subgroup of new employed nurses (36 nurses) was recruited in the comparison group (lecture group), we applied the same instruction to this subgroup regarding consenting, pretest and posttest and providing lecture using (PowerPoint presentation)®, so that the total number of participants in the lecture group was 70 nurses. Thus, there was only one presenter for all sessions either in the game or lecture group.

For the game group (experimental), the same topic (pressure injury) was presented, through the educational game cards method, in four different times, according to the employments process, in which different number of nurses was employed in different times.

The total number of nurses, who participated in the game, was 86 nurses, and employed in the hospital as the following, at December 2018 (15 nurses employed), at February 2019 (40 nurses employed), , at April 2019 ( 31 nurses employed), so that game sessions was done four times at different times; because game session should be presented for small number of attendants, depending mainly on group discussion, unlike lecture, which could be presented to large number of attendants.

At each game session, details was provided to nurses,

regarding the importance of their participation in this study, and their voluntary participation in the study, and they can withdrawa from the study at any time, but they should attend the educational session; because it is part of their orientation program, and, they are free not to take pre and posttest; After that, nurses were given instructions, on how to fill the demographic data, pretest, and posttest, and then a pretest was provided to all participants. After that, the game session (educational cards method) provided, which was extent for about four hours, including the pretest and posttest.

In each game session, participants were distributed into teams; each team has 5-6 nurses, and those nurses selected a leader. For example, if we have 20 nurses participated, we divided them into four teams, 5 nurses each, one of them will the leader. Each leader was responsible for answering the questions mentioned in the educational cards, these educational cards was prepared to cover the topic of pressure injury and has asked during the session after agreed on the answer with team members. These questions built-in different types, such as multiple-choice questions, fill in blanks, true and false, and listing questions. Moreover, an expert in wound care revised those questions for content. All game sessions were conducted by the same person who responsible to moderate discussion and to give a rational for correct, or incorrect answer, also the other researchers have an important roles in conducting the session, so one researcher is needed to be responsible for timekeeping and score recording,

In the beginning of each game session, nurses filled demographic data, then pretest was provided to nurses, then the game session started.

The game cards were prepared in an envelope containing all questions which will be asked in sessions , and each team was given one envelope; in order to be familiar with the questions asked during the session, these questions in the game cards were asked to each team irregularly. For example, the first question was given to team number 3, and question 2 was given to group 5; because participants should not know the next question to which team will be asked, we gave them three minutes to answer each question. Team members agreed to answer the question; then, the team leader answered the question. Then, the presenter commented with rationale on the answer, either correct or wrong, then if their answer was correct, we gave them one score, and they got zero scores, if their answer was wrong, these scores were recorded on a

board by a second person, who shared with the instructor in the game sessions, and worked as score recorder and timekeeper, and was one of the research team. After that, we shifted to the next question and so on until the game session finished. At the end of the game session, we acknowledged the team who got the highest score; after that posttest was conducted.

The instrument used composed of two parts. The first part was the demographic, and the second part was the knowledge acquisition exam (pretest and posttest). The demographic data include age, gender, educational level, and previous experience; the research team prepared the knowledge acquisition exam( pretest and posttest) based on online Lippincott examination for pressure injury, so it was reliable and valid to measure the knowledge of the participants regarding pressure injury, this exam composed of fifteen multiple-choice questions that measure nurse’s knowledge of pressure injury. The higher score mean, the best the educational method will be.

*Data Analysis method*

Data were analyzed using the Statistical Package of Social Science (SPSS) Version 22 for Window. Descriptive analysis was performed on all variables based on the level of measurement. The Kruskal wallis test was used to compare pretest scores among participants in both groups and used to comare posttest scores among both groups. Wilcoxon Rank we compare the mean score for the pretest and posttest in the game group, and it was used to compare the mean scores for the pretest and posttest for the lecture group.

**Results**

The total number of participants was 156 staff nurses, 70 (44.9%) in the lecture group and 86 (55.1%) in the game group. Most of them were female 71.8% (n=112). The number of females in the lecture group was 59 (84.3%), the number of males was 11 (15.7%). But in the game group, the female was 53 (61.6%), the male was 33 (38.4%), with a mean of age was 24.1 years (SD= 3.68) in the game group, but in the lecture group, the mean age was 22.4 years (SD= 1.73). The mean of experience (1.27) years in the game group and the mean experience among participants in the lecture group was (0.43) years (as shown in Table 1).

Before performing the intervention, the Kruskal Wallis test was used to compare pretest scores among

Table 1. Demographic Data

		Game		Lecture		P
		Frequency	%	Frequency	%	
Gender	Male	33.00	38.40%	11	15.70%	0.002
	Female	53.00	61.60%	59	84.30%	
Age Mean, SD		24.10	3.68	22.4	1.73	0.001
Experience		1.27	2.65	0.43		0.023
Pre- total score		6.88	1.75	6.91	1.77	0.914
Post- total score		8.17	1.59	9	2.14	0.006
Paired Pre- Post Sig		0.12		0.011		

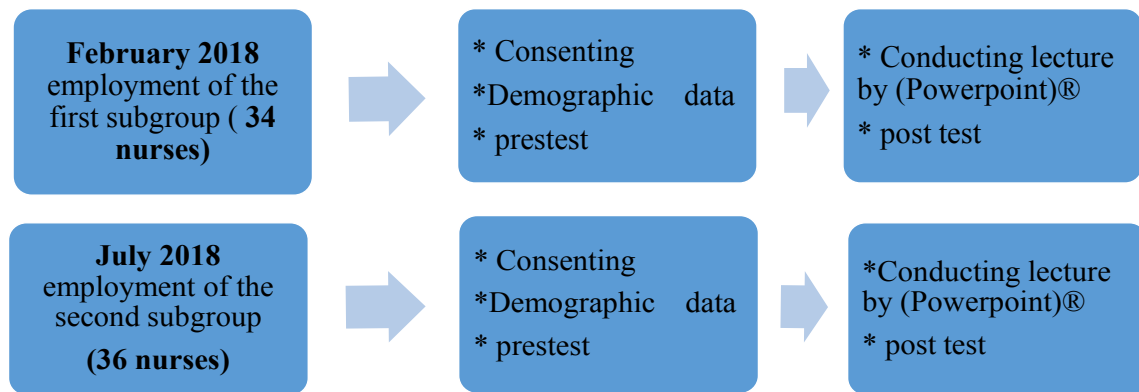


Figure 1. Lecture Session Diagram

participants in both groups; we assumed that when participants answered any question in the exam correctly, we gave them one, and when they answered them wrongly, we gave 0, the mean score for the game group was 6.88 (SD 1.75). However, the mean score for the lecture group was 6.91(SD 1.77). In addition, there was no significant difference between the mean score of both groups ( $P= 0.988$ ), which means that the sample was

homogeneous (as shown in Table 2).

For the game group, we compared mean score for each question, and we compare the mean score for the pretest and posttest using Wilcoxon Rank; the total mean score for the pretest was 6.88, and the total mean score for the posttest was 8.17, and there was a significant difference between total mean score ( $P= < 0.001$ ). Moreover, there was a significant difference in some questions; the

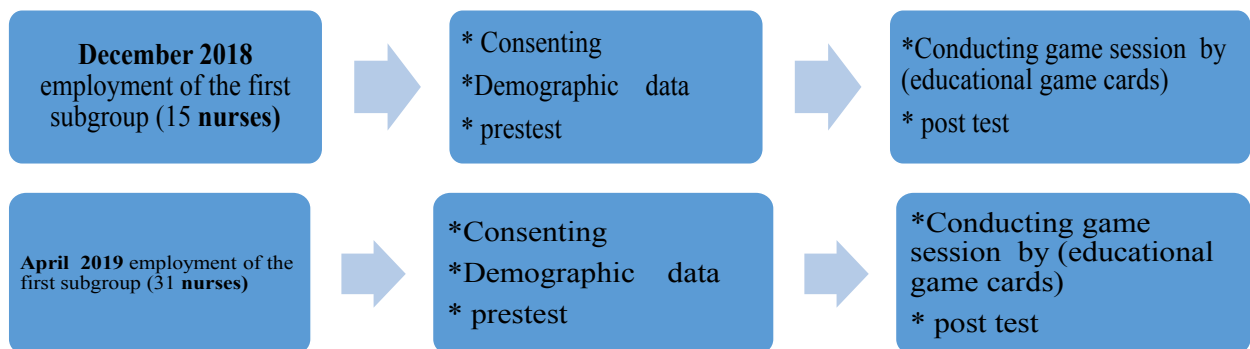


Figure 2. The First Game Session

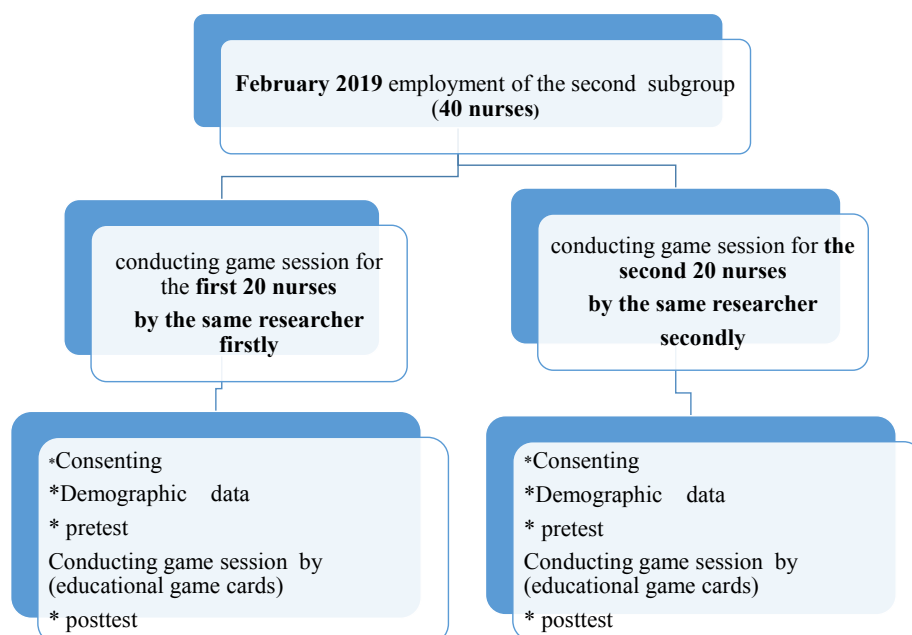


Figure 3. The Second and Third Game Session

Table 2. Comparing Pretest Score for the Game Group with the Pretest Scores for the Lecture Group Using Kruskal-Wallis

Type		N	Mean+ SD			N	Mean+ SD	P
Game	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	86	0.69+ 0.47	Lecture	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	70	0.74+ 0.44	0.437
	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	86	0.49+ 0.5		Which of the following are primary risk factors for pressure ulcers? Select all that apply.	70	0.67+ 0.47	0.022
	Which statement, if made by the client or family member, would indicate the need for further teaching?	86	0.50 + 0.5		Which statement, if made by the client or family member, would indicate the need for further teaching?	70	0.51+0.50	0.86
	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	86	0.45+ 0.5		When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	70	0.40+ 0.49	0.503
	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	86	0.42+ 0.5		You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	70	0.47+ 0.50	0.51
	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	86	0.43+ 0.5		True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	70	0.57+ 0.50	0.08
	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	86	0.50+ 0.5		Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	70	0.54+ 0.5	0.595
	Who of the following is the most at risk for a pressure ulcer:	86	0.48+ 0.5		Who of the following is the most at risk for a pressure ulcer:	70	0.43+0.50	0.549
	Which is not true of a stage III pressure ulcer?	86	0.47+ 0.5		Which is not true of a stage III pressure ulcer?	70	0.33+0.47	0.085
	Which of the following is not a risk for pressure ulcer development	86	0.42+ 0.5		Which of the following is not a risk for pressure ulcer development	70	0.40+0.49	0.815
	Which of the following influence resistance of skin integrity?	86	0.44 +0.5		Which of the following influence resistance of skin integrity?	70	0.46+0.50	0.849
	True or False:Healing can occur despite necrotic tissue in the wound.	86	0.41+ 0.49		True or False: Healing can occur despite necrotic tissue in the wound.	70	0.41+0.50	0.927
	Which of the following are ways not preventing pressure ulcers?	86	0.37+ 0.49		Which of the following are ways not preventing pressure ulcers?	70	0.43+0.50	0.475
	What would be indicative of a Stage 3 Pressure Sore?	86	0.49+ 0.5		What would be indicative of a Stage 3 Pressure Sore?	70	0.30+0.46	0.017
	The dermis does not consists of	86	0.34+ 0.48		The dermis does not consists of	70	0.24+0.43	0.2
	PreTotal	86	6.88+ 1.75		PreTotal	70	6.91+1.77	0.988

improvement was significant in 5 questions only out of 15 questions, as shown in Table 3.

For the lecture group, we compare the mean score for each question and the mean score for the pretest and posttest using Wilcoxon Rank. The total mean score for the pretest was 6.91, and the total mean score for the posttest was 9, and there was a significant difference between the total mean score ( $P = < 0.001$ ). Moreover, there was a significant difference in some questions, and the improvement was effective in 7 questions only out of 15 questions, as shown in Table 4.

For the posttest mean differences, the Kruskal-Wallis test was used to compare the total mean score between both groups; the posttest means a score of the game group was 8.17, and the posttest mean score of the lecture

group was 9. Moreover, there was a significant difference between the posttest mean scores of both groups to the favor of the lecture group ( $P = 0.003$ ), as shown in Table 5.

## Discussion

There were many limitations to the current study. Firstly, in our study, we considered nurses who were newly employed in the hospital by using a convenient sampling method; secondly, we used the quasi-experimental design without randomization. The type of sampling (convenient) affects the generalizability of the results; thirdly the current study results indicated games as an educational method had a positive effect on knowledge acquisition of nurses. It is still less effective than traditional lecturing;

Table 3. Comparing Pretest and Posttest Scores for the Game Group Using Wilcoxon Rank ( n= 86)

Type	Pre	Mean+ SD	Post	Mean +SD	P
Game	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.69+ 0.47	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.72+ 0.45	0.439
	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.49+ 0.5	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.66+ 0.48	0.004
	Which statement, if made by the client or family member, would indicate the need for further teaching?	0.5+ 0.5	Which statement, if made by the client or family member, would indicate the need for further teaching?	0.62+ 0.49	0.025
	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.45+ 0.5	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.56+ 0.5	0.061
	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.42+ 0.5	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.44+ 0.5	0.637
	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.43+ 0.5	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.49+ 0.5	0.197
	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.5+ 0.5	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.53+ 0.5	0.317
	Who of the following is the most at risk for a pressure ulcer:	0.48+ 0.5	Who of the following is the most at risk for a pressure ulcer:	0.5+ 0.5	0.564
	Which is not true of a stage III pressure ulcer?	0.47+ 0.5	Which is not true of a stage III pressure ulcer?	0.56+ 0.5	0.059
	Which of the following is not a risk for pressure ulcer development	0.42+ 0.5	Which of the following is not a risk for pressure ulcer development	0.49+ 0.5	0.134
	Which of the following influence resistance of skin integrity?	0.44+ 0.5	Which of the following influence resistance of skin integrity?	0.47+ 0.5	0.564
	True or False:Healing can occur despite necrotic tissue in the wound.	0.41+ 0.49	True or False:Healing can occur despite necrotic tissue in the wound.	0.44+ 0.5	0.439
	Which of the following are ways not preventing pressure ulcers?	0.37+ 0.49	Which of the following are ways not preventing pressure ulcers?	0.57+ 0.5	< 0.001
	What would be indicative of a Stage 3 Pressure Sore?	0.49+ 0.5	What would be indicative of a Stage 3 Pressure Sore?	0.64+ 0.48	0.009
	The dermis does not consists of	0.34+ 0.48	The dermis does not consists of	0.49+ 0.5	0.005
Total		6.88+ 1.75	Total	8.17+ 1.59	< 0.001

this might happen because newly employed nurses have experience in the lecturing method and have no previous experience with game-based learning. The number of nurses was in the lecture group less than nurses who participated in the game group.

Education in the clinical area focuses on the competencies of health care professionals, which might help prepare skillful and safe health care professionals when caring for patients, thus improving patients' quality of care and decreasing morbidity and mortality (Murphy &

Timmins 2009). The study results revealed no significant differences between pretest mean scores of both groups, indicating the homogeneity of the sample.

The results revealed improvement in the participants' knowledge in both groups, but the improvement was significant for the lecture group. Moreover, our result indicated that the difference in the mean scores between the pretest and posttest in the lecture group was significant. Furthermore, the difference in the mean scores between the pretest and posttest for the game group was not significant.

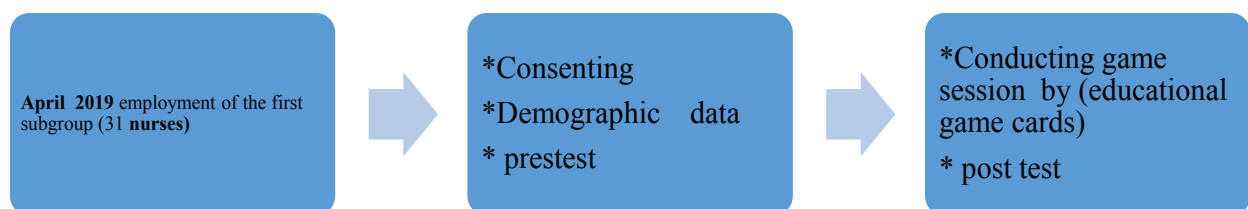


Figure 4. The Fourth Game Session

Table 4. Comparing Pretest and Posttest Scores for the Lecture Group Using Wilcoxon Rank (n=70)

pre		Mean+ SD		Mean+ SD	P
Lecture	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.74+ 0.44	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.73+ 0.45	0.796
	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.67+ 0.47	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.8+ 0.4	0.061
	Which statement, if made by the client or family member, would indicate the need for further teaching?	0.51+ 0.5	Which statement, if made by the client or family member, would indicate the need for further teaching?	0.74+ 0.44	0.002
	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.4+ 0.49	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.66+ 0.48	< 0.001
	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.47+ 0.5	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.73+ 0.45	< 0.001
	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.57+ 0.5	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.59+ 0.5	0.782
	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.54+ 0.5	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.66+ 0.48	0.102
	Who of the following is the most at risk for a pressure ulcer:	0.43+ 0.5	Who of the following is the most at risk for a pressure ulcer:	0.5+ 0.5	0.096
	Which is not true of a stage III pressure ulcer?	0.33+0.47	Which is not true of a stage III pressure ulcer?	0.53+ 0.5	< 0.001
	Which of the following is not a risk for pressure ulcer development	0.4+ 0.49	Which of the following is not a risk for pressure ulcer development	0.61+ 0.49	0.002
	Which of the following influence resistance of skin integrity?	0.46+ 0.5	Which of the following influence resistance of skin integrity?	0.56+0.5	0.108
	True or False:Healing can occur despite necrotic tissue in the wound.	0.41+ 0.5	True or False:Healing can occur despite necrotic tissue in the wound.	0.53+0.5	0.074
	Which of the following are ways not preventing pressure ulcers?	0.43+0.5	Which of the following are ways not preventing pressure ulcers?	0.63+0.49	0.002
	What would be indicative of a Stage 3 Pressure Sore?	0.3+ 0.46	What would be indicative of a Stage 3 Pressure Sore?	0.43+ 0.5	0.061
	The dermis does not consists of	0.24+ 0.43	The dermis does not consists of	0.31+ 0.47	0.225
	Total	6.9+ 1.8	Total	9+ 2.14	< 0.001

This indicated that the lecture as a learning method might be an effective method than game-based learning.

Many studies supported our result; one of these studies, the participants were undergraduate medical students, conducted by Tubelo et al. (2019), who found no significant difference between the control and game groups. They reported that both methods were effective to the same degree. However, most participants mentioned that the game had understandable instructions, and the content was presented clearly. Tan et al. (2017) compared the effectiveness between serious game and didactic methods in providing nursing students' knowledge and practice toward blood transfusion. The results revealed an improvement in the mean scores in the posttest for both groups compared to the pretest mean scores. However, there was no significant difference between both groups on the posttest mean scores. Both methods were effective in the same degree, and the participants positively evaluated the game.

Other studies found that game was more effective than

other educational methods. Aljezawi & Albashtawy (2015) compared the lecture and Jeopardy-style quiz game to gain and retain knowledge among nursing students who studied care delivery systems. The results revealed an improvement in the posttest scores after conducting the two teaching formats, but the game group was significantly better than the lecture group in the posttest. In addition, the game group was significantly better than the lecture group in the retention test. In addition, they assessed students' satisfaction after conducting the two sessions, showed that students in the game group were happier with the teaching strategy than the lecture group.

Strickland & Kaylor (2016) conducted a study wherein 112 nursing students participated in the Fundamentals of Nursing course game. The feedback of students and the faculty regarding the game is a positive instructional strategy. In addition, they perceived that the game promoted a learner-centered learning strategy.

Woolwine et al. (2019) conducted a descriptive correlational study to examine the effect of gamification



Table 5. Comparing Posttest Score for the Game Group with and Posttest Scores for the Lecture Group Using Kruskal-Wallis ( n game=86) , n lecture = 70)

Type	Mean+ SD		Mean+ SD	P		
Game	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.72+ 0.45	Lecture	Your client has a Braden scale score of 17. Which is the most appropriate nursing action?	0.73+ 0.45	0.916
	Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.66+ 0.48		Which of the following are primary risk factors for pressure ulcers? Select all that apply.	0.8+ 0.4	0.057
	Which statement, if made by the client or family member, would indicate the need for further teaching?	0.62+ 0.49		Which statement, if made by the client or family member, would indicate the need for further teaching?	0.74+ 0.44	0.095
	When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.56+ 0.5		When working with an older person, you would keep in mind that the older person is most likely to experience which of following changes with aging?	0.66+ 0.48	0.21
	You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.44+ 0.5		You are caring for an assigned client and notice a superficial ulcer on the client's buttock that appears as a shallow crater involving the epidermis and the dermis. Which of the following stages would you say best describes this break in skin integrity?	0.73+0.45	< 0.001
	True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.49+0.5		True or False: When determining tunneling of a pressure ulcer, one must use an applicator to determine the deepest point. The nurse should assess the depth of tunneling in a clockwise method; the patient's feet represent 12 o'clock	0.59+0.5	0.227
	Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.53+0.5		Meg Griffin is experiencing thick, foul smelling, green exudate from a wound. What kind of drainage is this?	0.66+0.48	0.124
	Who of the following is the most at risk for a pressure ulcer:	0.5+0.5		Who of the following is the most at risk for a pressure ulcer:	0.5+0.5	1
	Which is not true of a stage III pressure ulcer?	0.56+0.5		Which is not true of a stage III pressure ulcer?	0.53+0.5	0.713
	Which of the following is not a risk for pressure ulcer development	0.49+0.5		Which of the following is not a risk for pressure ulcer development	0.61+0.49	0.117
	Which of the following influence resistance of skin integrity?	0.47+0.5		Which of the following influence resistance of skin integrity?	0.56+0.5	0.254
	True or False:Healing can occur despite necrotic tissue in the wound.	0.44+0.5		True or False:Healing can occur despite necrotic tissue in the wound.	0.53+0.5	0.283
	Which of the following are ways not preventing pressure ulcers?	0.57+0.5		Which of the following are ways not preventing pressure ulcers?	0.63+0.49	0.458
	What would be indicative of a Stage 3 Pressure Sore?	0.64+0.48		What would be indicative of a Stage 3 Pressure Sore?	0.43+0.5	0.009
	The dermis does not consists of	0.49+0.5		The dermis does not consists of	0.31+0.47	0.028
Total		8.17+1.59	Total		9+2.14	0.003

on nurses' knowledge retention and motivation (n=152), and they found a significant difference between pretest scores and posttest scores. Moreover, Whittam & Chow (2017) examined the effectiveness of the educational board game method on the knowledge of physicians and nurses regarding the assessment and management of severe burn injuries. They found that this method has improved skills and knowledge, stimulated discussion, and provided a relaxed environment.

A cross-sectional study conducted by Koivisto et al. (2016) examined the nursing student's experiences of learning clinical reasoning by the educational game method. Students reported that they learned the best of how they use theoretical knowledge effectively while playing, and they learned to apply their previous experiences of patient care while playing. In addition to that, Abdulmajed et al. (2015) concluded that game-based

learning positively impacted the teaching and learning process. In addition, they reported that educators should consider many factors while conducting research regarding the effectiveness of game, such as research design, sample size, Teacher's abilities and student preferences, level of knowledge, and skills gained from the game, and the game description such as its types, rules, material, setting, and costs. Gorbanev et al. (2018) reported that game developers claim that games are useful pedagogical tools. However, medical educators prefer simulations and quizzes that focus on knowledge retention and skill development through repetition and do not demand the use of sophisticated games in their classrooms. Moreover, public access to medical games is limited.

Games as a learning method were revealed from previous studies to be an effective knowledge acquisition and retention method. However, in our study, we found

that lectures were more effective than games in knowledge acquisition.

More studies should be conducted with a larger sample to examine the effectiveness of game-based learning methods versus other learning methods.

### Author Contribution Statement

Izzeldeen Almashayek, RN, MSN (Corresponding author), Roles: Conceptualization, Data Curation, Formal Analysis, Methodology, Project Administration, Resources, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Hisham Al-khateeb, RN Roles: Investigation, Methodology, Resources; Mustafa Bader, RN Roles: Investigation, Methodology, Resources

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Nurses who agreed to participate in the study signed informed consent, and their confidentiality was assured during all study phases. All nurses were informed that they could withdraw from the study at any time, this will not affect their employment status, their participation is voluntary, his/her personal information, the (pre and post) tests results will be kept in a safe place, the data which will be originated from the study will be used in research purpose, these results will not affect their employment status.

The ethical approval for conducting the study was obtained from the Institutional Review Board (IRB) committee of King Hussein Cancer Center, numbered as (18 KHCC 11), on Feb 08, 2018.

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#### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

The study was not registered in any registry dataset

#### Conflict of Interest

No conflict of interest.

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