

# E-learning vs Standard Lecture: Which is the Best Approach to Improve Senior Nursing Students' Skills in Pressure Ulcer Classification?

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## Abstract

The ability to classify pressure ulcers correctly is an important skill that every bedside nurse and nursing student should have, in order to institute appropriate intervention for each patient suffering from pressure ulcers. Misclassification of pressure ulcer is a common among healthcare providers. Education and training about this topic is essential to expand nurses' and nursing students' skills and knowledge. Currently, the training is based mainly on traditional lecture teaching, while the uses of e-learning education for pressure ulcer care still in its infancy. The purpose of this study was to assess nursing students' skills to classify pressure ulcers correctly, and to evaluate the effect of an e-learning program on improving students' pressure ulcer classification skills. Using a quasi-experimental that involved pre-test-post-test control group design. Senior nursing students in one public university in Jordan were randomly assigned to an intervention group (n=47), and a control group (n=48). The intervention group received an e-learning educational program about pressure ulcer classification, and the control group received a traditional, standard lecture about the same topic. Both groups were asked to complete a pre-test and, after the training sessions, they completed a post-test of the same contents. The participants' skills in classifying pressure ulcers were inadequate at the pre-test. Furthermore, the inter-rater reliability of pressure ulcer classification was poor. The skills were improved markedly after both types of training were received, with better results displayed by the e-learning program (intervention group  $M=14.9$ ,  $SD=2.68$ ; control group  $M=9.5$ ,  $SD=2.58$ ;  $p=0.03$ ). The inter-rater reliability, including both the Cohen Kappa and the percentage of agreement, was also improved after the education programs were administered, again with the intervention group being superior (intervention group  $k=0.62$ , % of agreement= 68.1%; Control Group  $k=0.38$ , % of agreement=48.2%). To summarize, participants' skills in pressure ulcer classification were limited. The E-learning program was superior to the conventional lecture in improving participants' skills of PU classification. Adoption of this type of training is recommended in nursing education.

**Keywords:** E-learning, Standard lecture, Pressure ulcer, Classification.

## 1. Introduction

Pressure ulcer (PU) classification tools are scales used to determine the level of PU damage (Bell 2005). The severity of PU cases ranges from erythema of intact skin to the destruction of skin, subcutaneous fat, muscle and bone (Nixon et al. 2005). In current clinical practice, numerous PU classification scales are employed to identify and classify the severity of tissue damage. The European Pressure Ulcer Advisory Panel (EPUAP) scale is one of the most commonly employed scales that is widely used in Europe (EPUAP 1998). It classifies PUs into four categories based on the severity of injury, ranging from Non-Blanchable erythema of intact skin to extensive destruction to muscles and bone.

The accurate assessment and classification of PU grade is a very important step in planning the prevention and treatment of PUs, otherwise resources will be wasted (Briggs 2006). Some reasons are given in the literature for classifying PU patients with an accurate grade (Briggs 2006). Firstly, it will affect patients' outcomes, as the provision of suitable prevention and management to PU patients depends on the accuracy of the data, and the cost of the resources allocated to PU patients will depend on their ulcer grade. Secondly, the classification of ulcers is central to PU audits, so a high level of confidence in its accuracy is required. Taken into account that PU is a common problem in different healthcare settings, its prevalence ranged in the USA from 14% to 17% (Whittington and Briones 2004), in Canada: 25% (Woodbury and Houghton 2004), in the UK: 17.5% (Srinivasaiah et al. 2007), and in Jordan; where the current work conducted was 12% (Tubaishat, Anthony, and Saleh 2011).

Therefore, nurses and nursing students should have enough knowledge and skills to assess PU accurately, enabling them to provide timely and appropriate intervention to prevent the progression of ulceration. This knowledge and skills can be gained through teaching and learning, whether this is provided electronically or in standard format.

There is an increased use of technological applications in higher education for teaching purposes across different faculties and universities (Muirhead 2007). Nursing education is no exception, where information and communication technology (ICT) has been rapidly developed and integrated into the field (Ajayi and Ajayi

2006). E-learning is one of these applications and is defined as a type of instruction delivered electronically to a remote learner via the Internet, intranets, or multimedia platforms such as CD-ROMs or DVDs (Smart and Cappel 2006).

There are general benefits of e-learning. It can deliver educational programs which are of high quality and cost effective, for a large number of learners in different geographical locations at the same time (Farrell 2006). It offers a self-paced learning style that suits individual learning speeds (Kruse 2002). Moreover, it is “learner centered”, as the learners control their education based on their own needs (Favretto, Caramia, and Guardini 2005). In addition, it is an interactive approach that actively engages the students in the learning process (Moore et al. 2012).

The effectiveness of e-learning as a teaching method for improving nurses’ knowledge and skills in PU classification has scarcely been studied. One study has been located which evaluates the effectiveness of e-learning programs in improving PU classification (Beeckman et al. 2008). In this, 212 registered nurses (RNs) and 214 nursing students were randomly assigned to an intervention group who participated in an e-learning program, and a control group who attended a standard lecture, where both teaching methods contained the same learning content on the topic of PU classification. The results showed that the PU classification skills of the nursing students who had participated in the e-learning program improved significantly, while among the RNs no difference between the learning methods was demonstrated. The authors’ explanation was that the students had had more previous experience with computer applications.

However, some studies have been conducted to evaluate the effect of traditional teaching on improving PU classification skills. Briggs (2006) conducted a study to assess the degree of accuracy in classification PU among nurses in one acute National Health Services (NHS) Trust in the UK. A sample of 52 nurses were asked to grade 20 PU photographs before and after receiving a traditional educational program about the practice of PU classification. The level of accuracy of the RNs in classifying PU was poor in the pre-test. Although there was marked improvement at the post test (the frequency of distribution of correct responses increased from 15.3% in the pre-test to 55.7% in the post-test), the overall performance remained less than satisfactory (between 80-100% correct answers), and this may have been due to lack of knowledge and experience in PU classification.

Kelly and Isted (2011) offered a training program in PU classification for nurses, using the magazine of the Trust, class-room based information and ward-based information, and noted that nurses correctly classified PUs 56% of the time before receiving the instructions, and this increased to 62% of the time after the learning materials were consulted. .

No study was found that has explored this area of interest in Jordan. Thus, the idea for the current work emerged. There were two main aims for the current study. The first was to assess the level of accuracy of senior nursing students in classifying PUs, and the second was to evaluate the effect of an e-learning program as a teaching method for improving students’ skills in PU classification. In fact, from this study, the light was shed on our second study which was conducted by the same author on the registered nurse, to explore the effect of e-learning on different samples.

## **2. Methodology**

### **2.1 Design**

A quasi experimental, that involve pre-test-post-test control group.

### **2.2 Setting**

The present study was conducted in the Faculty of Nursing of one public university located in the North of Jordan. This faculty grants the degree of Bachelor in Nursing after four years of study. The total number of students from the first year to the fourth, based on the latest record of the registry (2012/2013), was 653, with between 140 and 170 students at each academic level.

### **2.3 Sample**

All senior nursing students in the last semester of their fourth academic year were invited to take part in the current study. This gave a total of 143 students. Based on the Bachelor program plan in Jordan, senior students in their final semester should follow the intensive clinical training module. In this module, the students receive a two-week orientation course before starting the actual clinical training in hospitals. During this period the entire accessible population was approached for the purpose of the present study.

This group of students was selected because they are just a step away from becoming RNs and they are expected to provide direct nursing care to different types of patients including PU patients. Furthermore, it was expected that these students would be used to providing direct care to PU patients during their study period since this was their third clinical year, as in Jordan students start to train in clinical settings from the second year onwards.

Thus, the inclusion criteria specify that a participant must be a senior student in their final semester

before graduation, who has agreed to take part in the study and completed all the phases. Students who were not in their final year and did not agree to participate were excluded from the study.

The sample size was calculated using G\* power software (Faul et al. 2007). A medium effect size of 0.50 was required for the purpose of this study. The power level was set at 0.80, and the conventional  $\alpha = 0.05$  two tailed criterion of the significance was specified. Based on that, the required sample size to address the study's aims was 70 students. All the senior students (n=143) in the faculty were approached for a dual purpose: so that the findings could be generalized for final year students across all universities in Jordan, and to overcome the problem of participants' attrition. Of the 143 students, 95 participated and completed the study phases. Simple randomization using a computer generated-list was used to assign the students to an intervention group (n=47) and a control group (n=48).

#### **2.4 Data collection procedures**

Once the groups were obtained, the same pre-test on PU classification was administered for both groups as a baseline measurement. After completing the pre-test, the intervention group took themselves independently through an e-learning program on machines provided in one of the computer laboratories in the Faculty. These laboratories are equipped with up-to-date desktops that contain most of the necessary software and applications needed for educational purposes. The control group attended a lecture on the same topic; PU classification. After completing the sessions, both groups were presented with a post-test in order to explore the effect of both educational methods on improving nursing students' skills in classifying PUs. The pre-test, the learning sessions, and the post-test were performed at the same time and followed one after another.

The web-based learning program that was followed by the intervention group was developed by the PU classification workgroup of the EPUAP, and is available to the public online. This e-learning tool provides information about how to classify PUs, along with clear definitions, high quality images of ulcers and videos. Quizzes are also available on the website to sharpen the user's skills. Despite the fact that the webpage is available to the public without any authentication, permission to use the content of the website was granted from the authors before the study was commenced. The link to the program given to the students just before the study started.

The control group received a standard lecture in a traditional classroom which was the usual site of the Faculty's lectures. One of the faculty members who had adequate teaching experience delivered the lecture. The lecture utilized a PowerPoint presentation with adequate discussion. Both types of teaching contained the same material, including texts, photographs and exercises, and took about one hour to complete.

#### **2.5 Instruments**

The data collection sheet consisted of three parts. The first was a section about participants' demographical data, including age, gender, and Grade point average (GPA). The second part was a pre-test scoring sheet, where the students were presented with 20 different PU photographs depicting normal skin, blanchable erythema, PU grades 1-4, and moisture lesions. The photographs had been validated previously by twelve experts from the PU classification workgroup, whose classification is considered a gold standard. The participants were asked to indicate their assessment of the photographs on the scoring sheet.

After receiving the training in both groups, the third part was given. Here, the same 20 photos were presented to the students, but in a different order, to reduce the possibility of recognition. Participants again indicated their assessment on the post-test scoring sheet. At the end of post-test, the students submitted all the sheets to one of the research assistants available in the classrooms. A score of 0 was given when the student's rating did not agree with the EPUAP expert's rating (wrong answer), and a score of 1 was given when there was agreement (correct answer). Thus, the total possible scores would range from 0-20. The higher scores would indicate a high level of skill in PU classification.

#### **2.6 Ethical considerations**

Permission to conduct the study in this particular institution was granted from the university's research and ethics committee. Students were given a clear written explanation of the study's objectives and procedures. Written informed consent was obtained from all participants. The subjects were informed that their replies would be treated as confidential at all times and that they could withdraw from the study at any time they decided without penalty. No course credit was given for their participation.

#### **2.7 Data analysis**

The SPSS version 17 was used to analyze the data. Descriptive statistics were used to describe the sample's characteristics. The PU classification skills were computed by adding up the number of correct answers given by each participant. A low score indicated a low level of skills in PU classification, and a high score a high degree of skills. To assess the homogeneity of the sample, the independent t-test was used. This test examine whether

there were any significant differences between the intervention and the control group's mean levels of PU classification skills at the pre-test stage. Again at the post-test, the same test was used to verify whether or not there were statistically significant differences between the intervention and control group in the mean scores for PU classification skills. The paired t-test was employed to assess whether or not there were statistically significant differences between the mean pre-test and post-test PU classification skills scores for students in the intervention and control groups.

Inter-rater reliability is a measure of whether two or more independent raters will assign the same grades to the same PU patient (Kottner, Dassen, and Tannen 2009). Two measures of inter-rater reliability are commonly employed. The first is the percentage of agreement, which measures the percentage of cases for which different raters agree on the same grade for the same patient (Ayello and Braden 2002). The second is Cohen's Kappa, which is also a measure of agreement between two raters, but considers the probability of obtaining agreement at random, where a k-value of 0.00 indicates the level of agreement that will occur as a result of chance, while  $k = 1.00$  when there is complete agreement (Anthony 1999). Generally, the interpretation of kappa will be: 0-0.20 'slight', 0.21-0.40 'fair', 0.41-0.60 'moderate', 0.61-0.80 'substantial', 0.81-1.00 'almost perfect' (Landis and Koch 1977). In this study, inter-reliability was calculated by means of the median Cohen's kappa (k) and the median percentage (%) of agreement. The differences in these reliability measures between the intervention and control groups were calculated using the Mann-Whitney U-test.

### 3. Results

#### 3.1 Demographics

A total of 95 students participated in the study. The mean age of the sample was 21.6 (SD=1.29). Due to the admission procedures of nursing faculties in Jordan, the majority of the participants were female students (75.8%, n=72). The mean GPA for the whole sample was 71.9 (SD= 5.65, Range 0-100). No significant differences between the control and intervention group in relation to baseline characteristics were found, indicating that both groups were homogenous (Table 1).

**Table 1: Demographic of the sample**

Characteristics	Total Group (n=95)		P value
	Experimental group n(%)	Control group n(%)	
Number of participants			
Pretest	47 (49.5%)	48 (50.5%)	
Posttest	47 (49.5%)	48 (50.5%)	
Age (years) M (SD)	21.46 (1.15)	21.76 (1.42)	0.27
Gender			0.11
Male	8 (8.4%)	15 (15.8%)	
Female	39 (41.1%)	33 (34.7%)	
Grade point average M (SD)	71.33 (5.02)	72.43 (6.23)	0.40

#### 3.2 PU classification skills

The pre-test results indicated that students' skills in classifying PUs correctly were very poor (Table 2). The Independent t-test showed that there was no statistically significant difference  $t(93) = -1.40$ ,  $p=0.17$  between the mean scores of intervention (M=6.3, SD=2.43) and the control group (M=5.7, SD=2.10) in terms of the students' ability to classify PU correctly (Table 2). Moreover, there was no significant difference found between the inter-rater reliability in the intervention ( $k=0.20$ , IQR=0.17) and control group ( $k=0.17$ , IQR=0.26) ( $p=0.69$ ) (Table 3), and the percentage of agreement was not significant either (Intervention group=29.1%; Control group= 25.9%,  $p=0.73$ ) (Table 3).

In the post-test, the results of the Independent t-test revealed a significant difference  $t(93) = -0.77$ ,  $p=0.02$ , with the intervention group showing a higher mean score for PU classification skills (M=14.9, SD=2.68) compared to the control group (M=9.5, SD=2.58) (Table 2). The inter-rater reliability increased significantly in the intervention group ( $k=0.62$ , IQR=0.16) compared to the control group ( $k=0.38$ , IQR=0.11) ( $p=0.04$ ) (Table 3). Furthermore, the percentage of agreement was also significantly different between the two groups (Intervention group=68.1%; Control group= 48.2%,  $p=0.03$ ) (Table 3).

The results of the paired t test indicated that the mean PU classification skills scores at the post-test were significantly higher than that at the pre-test for the intervention group ( $t(46) = -6.827$ ,  $p<0.001$ ) and the control group ( $t(47) = -9.342$ ,  $p<0.001$ ). This revealed that students' knowledge was markedly improved after the application of either the traditional lecture in the control group or the e-learning program in the intervention group. However, as shown in Table 2, the independent t-test demonstrated that e-learning is significantly more effective than the traditional lecture in improving the skills of PU classification. However, these results coincide the findings of our study on registered nurse that will be presented elsewhere.

**Table 2: Skills of PU classification in the experimental and control group**

Characteristics	Total Group (n=95)		t(93)	P value
	Experimental group n=47 M (SD)	Control group n=48 M (SD)		
Pretest for PU classification	6.3 (2.43)	5.7 (2.10)	-1.40	0.17
Posttest for PU classification	14.9 (2.68)	9.5 (2.58)	-0.77	0.02*

**Table 3: Inter-rater reliability in the experimental and control group**

Characteristics	Total Group (n=95)		U	P value
	Experimental group n=47	Control group n=48		
Pretest				
k (IQR)	0.196 (0.17)	0.166 (0.26)	-0.71	0.69
% of agreement (IQR)	29.1 (18.3)	25.9 (21.1)	-1.09	0.73
Posttest				
k (IQR)	0.62 (0.16)	0.38 (0.11)	-1.69	0.04*
% of agreement (IQR)	68.1 (15.3)	48.2 (17.1)	-0.87	0.03*

**K: Cohen kappa. \* P is significant at <0.05**

#### 4. Discussion

The results of this study indicated that the skills of all subjects in classifying PU correctly were poor (intervention group M=6.3; control group M=5.7). However, the classification skills of the participants improved after training was administered, whether by means of a lecture or the e-learning program. Moreover, the intervention group (e-learning program) showed a more significant difference than the control group (standard lecture) at the post-test. These findings are in harmony with Beeckman et al (2008), who found that the skills of RNs and nursing students improved after both types of education were received, with the nursing students achieving better results through the e-learning program. However, the participants in that study and as well as the present one were chosen conveniently and this may constitute a threat to external validity.

Inter-rater reliability regarding PU classification in the pre-test was also limited (intervention group k=0.20; control group k=0.17). Several studies have been conducted about the EPUAP classification scale's inter-rater reliability, with high variation being reported. Some studies reported a low kappa ranging from 0.31 to 0.37 (Pedley 2004, Defloor et al. 2006, Beeckman et al. 2007) and other communicate a high kappa of 0.8 (Defloor and Schoonhoven 2004). The weak reliability of the current study might be because of the participants' knowledge and skills of classification. More training and experience in classifying PUs is needed in practice if reliable results are sought. Jordanian nursing students never have the opportunity to train on any PU classification scheme. This could be due to a problem in the Jordanian nursing curriculum where PU elements are lacking.

However, the result showed that the inter-ratter reliability was improved following both types of teaching (intervention group k=0.62; control group k=0.38), with a better result displayed by the intervention group. This coincides with the results of Beeckman et al (2008), who found that the Cohen's kappa improved significantly as a result of the e-learning program on PU classification (from k=0.24 to k=0.65, p=0.003). The percentage of agreement followed the same pattern as, for the e-learning users in the current study it increased from 29.1% to 68.1%.

As has been noted, the level of accuracy in classifying PU and the reliability of classifying improved after the e-learning program was attended. It has been proposed that nowadays efficient learning will be unfeasible without e-learning skills (Farrell 2006). In US and UK universities, the use of e-learning to support nurses' education has expanded (Farrell 2006). The revolutions of the internet and computer technology might have facilitated this shift, as the electronic delivery of educational materials is becoming more common than the traditional lecture (Stephenson, Brown, and Griffin 2008). In fact, it has been recommended internationally that every health educational program should have one e-learning element as a minimum (Farrell 2006).

Abdelaziz et al (2011) conducted a study to evaluate the impact of using an e-learning program versus the standard lecture at one large state nursing faculty. Data was collected about knowledge gained, attitude, practice, and opinion towards these teaching methods. The results demonstrated that students using the e-learning program were more satisfied than their counterparts, that they extended their understanding of the subjects covered, and that they found e-learning to be a more effective method. Moreover, they indicated that their computer skills had been sharpened after completing the e-learning program.

Moore et al (2012) carried out a study to evaluate an online educational program developed to improve the knowledge and skills of healthcare professionals working with patients affected by mesthesioma. The results suggest that the developed program was rewarding and improved the nurses' confidence, skills level, knowledge



and ability to support patients suffering from the disease.

As suggested by the current work, and other similar studies, the adoption of e-learning programs may be more beneficial than standard methods of teaching. Thus, the implication of this study is that these e-learning programs should be incorporated into nursing education curriculums and programs. However, students need to possess the required skills for dealing with computers and technology to be able to use the e-learning programs effectively, not only during their study time, but throughout their future careers. Therefore, and as a recommendation of the current work, the challenges and difficulties of using e-learning programs in nursing education should be explored from the students', tutors', and administrators' perspectives. In addition to this, iteration of the current study on a larger scale is recommended to investigate whether or not the significant findings can be sustained among a larger, heterogeneous sample. The use of a longitudinal design to investigate the effect of e-learning on PU classification over time could be promising.

However, the findings of the present study should be generalized with special caution and after certain limitations are taken into account. This study was conducted in only one research site in Jordan. Despite the fact that tutors, students, and clinical experience most likely are not the same across Jordan, the educational policies in all Jordanian universities are similar to some extent, in terms of study plans, curriculums, and course content. Students were selected using the convenience sampling technique and this could limit the generalizability of the findings. The use of photographs of PUs could be misleading sometimes. Unlike with real PUs, the photos give a static, two dimensional image of the wound. Thus, the assessment would be difficult to perform and therefore it would be hard to give an accurate grade.

## 5. Conclusion

Taken into account the mentioned limitations of the current work, Jordanian nursing students' skills in classifying PU are poor. This could be caused by a lack of knowledge and experience in classifying PUs, which means that education about PU classification is necessary. After both educational formats were delivered, the participants' skills in classifying PUs correctly and the inter-rater reliability improved significantly, with the e-learning program being superior to the standard lecture. Thus, the current work adds to the body of knowledge showing that the use of the e-learning method of teaching could be promising. The e-learning programs provide a more flexible, organized and interactive approach which concentrates on learner "teaching" rather than on tutor "education".

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