

The Effectiveness of an e-Learning Program to Improve Pressure Ulcer Classification by Nurses

Ahmad Tubaishat, RN, PhD

Al al-Bayt University/ Faculty of Nursing

P.O.Box: 130040

Mafrqa 25113

Jordan

Abstract

Background: Classification of pressure ulcers by staff nurses is a necessary practice. To perform accurate classification of these ulcers, education and training is needed. Most of this training is delivered through traditional teaching strategies but nowadays there is an increasing shift towards electronic methods. The effect of e-learning programs on users' knowledge and skills, especially in the field of pressure ulcer classification, is still under investigation. **Aims:** To evaluate the effectiveness of an e-learning program on enhancing nurses' skills in PU classification. **Design:** A quasi-experimental design. **Methods:** Nurses participated in a specialized training courses at one branch of the Jordanian nurses and midwifery Council invited to take part. Those who agreed to participate were assigned randomly to an experimental group ($n=119$), and a control group ($n=120$). Nurses in the control group attended a traditional lecture about pressure ulcer classification, and those in the experimental group received an e-learning educational program about the same topic. Both groups were requested to perform a pre-test, and after the training they completed a post-test of identical contents. **Results:** The nurses' pressure ulcer classification skills were insufficient at the pre-test stage. Both types of teaching improved these poor skills, with e-learning demonstrated to be more effective, as results for the experimental group showed statistical significance ($M=16.1$, $SD=1.59$) compared to those for the control group ($M=10.4$, $SD=1.44$) ($p=0.03$). **Conclusion:** Jordanian nurses' pressure ulcer classification skills were lacking. The use of the E-learning program was more effective than the standard teaching method in improving subjects' skills of pressure ulcer classification.

Keywords: E-learning tool, Nurses, Pressure ulcer, Classification, Jordan

1. Introduction

Pressure ulcer (PU) is a common problem in different healthcare settings. The prevalence of PU in Canada was 25% in acute care settings (Woodbury & Houghton, 2004) and in the USA it ranged from 14% to 17% (Whittington & Briones, 2004). Across five European countries the prevalence was 18.1% (Vanderwee, Clark, Dealey, Gunningberg, & Defloor, 2007). In Jordan, the site of the current study, the rate was 16% (Tubaishat & Aljezawi, 2013). Accurate classification of these ulcers is essential to provide appropriate prevention measures and treatment (Briggs, 2006) and several PU classification systems exist (Bell, 2005). One of these is the European Pressure Ulcer Advisory Panel (EPUAP) scale (EPUAP, 1998) which classifies PUs into four grades, depending on the severity of injury, ranging from Non-Blanchable erythema to extensive damage to muscles and bone.

Although the EPUAP scale is widely used by registered nurses (RNs) in Europe, PUs are still often classified inaccurately (Defloor, Schoonhoven, Vanderwee, & Myny, 2006). Therefore, nurses should possess adequate knowledge to assess and diagnose PU correctly which could, in turn, allow them to allocate appropriate and timely intervention. Knowledge can be attained through teaching and learning, whether this is provided electronically or in standard format. However, care providers should keep ahead of new insights in teaching (Beeckman, Schoonhoven, Boucque, Van Maele, & Defloor, 2008).

The use of technological innovations in education is increasing (Muirhead, 2007). E-learning is one of these innovations that provide knowledge and skills using electronic technologies such as internet- or computer-based instructions on local or wide networks (Beeckman, et al., 2008).

It is assumed that e-learning can deliver high quality and cost effective programs to large groups of users in scattered geographical areas simultaneously (Farrell, 2006). Moreover, it provides self-paced learning that meets individual needs (Favretto, Caramia, & Guardini, 2005), and it is capable of engaging students interactively in the learning environment (Moore, et al., 2012).

The impact of e-learning on the improvement of nurses' skills and knowledge in PU classification has barely been studied. Beeckman et al (2008) evaluated the effect of an e-learning tool in improving PU classification among 212 RNs and 214 nursing students using an experimental design. Participants were randomly assigned to an experimental group who took part in an e-learning program, and a control group who participated in a standard lecture about PU classification. The findings revealed that, in the case of the nursing students', the e-learning program improved their skills significantly but there was no difference between the learning methods for the RNs. Morente et al. (2014) carried out a randomized controlled trial among undergraduate nursing students to evaluate the effectiveness of an e-learning program on PU training as compared to traditional teaching strategies. The experimental group followed an e-learning program for PU assessment and diagnosis developed by the authors, and the control group received traditional on-campus teaching. The findings showed that the e-learning program was more effective than the traditional teaching. The students' scores in the control group improved from 8.23 (pre-test score) to 11.6 (post-test score) whereas in the experimental group they improved from 8.27 to 15.8 ($p=0.01$).

A number of studies have evaluated the effect of conventional teaching methods on enhancing nurses' skills in PU classification. Kelly and Isted (2011) assessed the degree of accuracy in PU classification among RNs who received PU classification training by means of the magazine of the institution, ward-based information and classroom based information in one of the UK hospitals (Kelly & Isted, 2011). It was found that nurses correctly classified PUs 56% of the time before attending the teaching, and this increased to 62% of the time after the training.

In Jordan, where the present research was carried out, no previous studies were located that had investigated this topic. Thus, it was necessary to explore this area, with an aim in mind to evaluate the effectiveness of e-learning as a teaching method for enhancing Jordanian nurses' skills in PU classification.

2. Methodology

2.1 Design

A quasi experimental, pre-test-post-test control group design was utilized to assess the effect of e-learning training on the accuracy of PU classification.

2.2 Setting

The current study was conducted in one branch of the Jordanian Nurses and Midwifery Council, with which all RNs in Jordan should be registered. The Council has three main branches and the one which serves nurses in the north of Jordan was chosen for reasons of convenience. This branch has sub-committees that organize its work. The Scientific committee has the responsibility to deliver specialized training courses on certain topics such as intensive care, accident and emergency, infection control, renal care and many others. Nurses working in the north of Jordan are invited regularly to attend such courses on a voluntary basis.

2.3 Sample

Nurses who attended some of these training courses over a period of 6 months were targeted for the purpose of this study. At the beginning of each course, the nurses were given a pamphlet highlighting the purpose and procedure of the study. Those who agreed to participate wrote their emails and phone numbers on a special form designed for this purpose, so that they could be contacted later by the author. More than 500 pamphlets were distributed during the courses, 312 of which were returned by subjects who were willing to participate. After duplicate pamphlets, those with insufficient contact details, and those completed by nurses who changed their minds and preferred not to participate were removed, the final sample for the study was 239 nurses.

Each participant was given a unique identifier number. Subsequently, a simple randomization using a computer-generated list was used to assign the nurses to an experimental group ($n=119$) and a control group ($n=120$).

2.4 Data Collection Procedures

After both groups were established, nurses assigned to the control group were invited on a pre-set day to attend a traditional lecture about PU classification. The lecture was held in the same classroom that is usually used to deliver courses in this branch of the Council. The author, who had adequate teaching experience, delivered the lecture, which employed a PowerPoint presentation format. Before the lecture, all subjects were requested to perform a pre-test on PU classification, where they were asked to grade 20 photos of PU. After the lecture they were asked to grade the same pictures, which appeared to them in a different order to reduce the possibility of recognition.

Those in the experimental group were sent a link to the e-learning program. This web-based learning tool was developed by the PU classification workgroup of the EPUAP. The program provides information about how to classify PUs, along with clear definitions, high quality images of ulcers and videos. Despite the fact that the webpage is available to the public without any authentication, permission to use the content of the website was granted by its authors before this study was commenced. Nurses in this group were requested to complete the pre-test by grading the same 20 photos, and gave assurance that they would do so before going through the remainder of the program. Subsequently, they navigated the educational material of the program on their own. At the end of program, the second round of grading was started immediately with the nurses grading the same 20 photos. All answers from the pre- and post-training exercises were emailed back to the researcher. Both types of training contained the same material, including texts, photographs and exercises, and took about one hour to complete. The pre-test, the learning sessions, and the post-test were performed one after another in each group.

2.5 Instruments

The data collection form consisted of three parts. The first was a section about subjects' demographical data, including age, gender, qualifications, area of specialty, and level of clinical experience. The second section was a pre-test scoring sheet, where the nurses were presented with 20 different PU photographs illustrating normal skin, blanchable erythema, PU grades from 1-4, and moisture lesions. The validity of the presented photographs was ensured previously by the agreement of twelve experts from the PU classification workgroup. Their classification was considered the gold standard. The nurses were asked to specify their assessment of the photos on the scoring sheet.

After completing the training, whether via the lecture or the e-learning program, the third part was provided. The same 20 photos were presented to the nurses and the subjects indicated their assessment on the post-test scoring sheet. A score of 0 was given when the nurses' grading did not agree with the EPUAP experts' grading (wrong answer), and a score of 1 was given when there was agreement (correct answer). Thus, the total potential scores would range from 0-20.

2.6 Ethical Considerations

Permission to conduct the study in this particular institution was granted before the study commenced. Written informed consent was attained from all subjects. In addition, a clear written explanation of the study's objectives and procedures was given. The participants were informed that their answers would be kept confidential at all times and that they could withdraw from the study at any time without consequences.

2.7 Data Analysis

Data was analyzed using the SPSS version 17. Descriptive statistics were utilized to express the characteristics of the sample. The PU classification skills scores were calculated by adding up the number of correct answers (i.e. correctly identified PU grades) obtained by each nurse. The scores could range from 0 to 20, with a low score demonstrating a low level of skills of PU classification, and a high score indicating a high level of skills. An independent t-test was employed to examine whether there were any significant differences between the experimental and the control group's mean levels of PU classification skills at the pre-test, to assess the level of homogeneity between the study's participants. The same test was also utilized to determine whether or not there were statistically significant differences between the experimental and control groups in the mean scores of PU classification skills at the post-test. A paired t-test was used to assess whether or not there were statistically significant differences between the mean pre-test and post-test PU classification skills scores for nurses in the experimental and control groups.

3. Results

3.1 Sample Characteristics

The mean age of the study sample was 32.4 years (SD=2.19). The majority of the sample was female (59%, n=138). Most of the nurses were holders of a Bachelor's degree (83.3%, n=199), worked in medical-surgical wards (40.5%, n=97), and had a mean of 7-8 years of experience. Both groups were homogenous, as no significant differences were found between the control and experimental group in relation to a number of baseline characteristics (Table 1).

Table 1: Demographic of the Sample

Characteristics	Total Group (n=239)		P value
	Experimental group n(%)	Control group n(%)	
Number of participants			
Pretest	119 (49.8%)	120 (50.2%)	
Posttest	119 (49.8%)	120 (50.2%)	
Age (years) M (SD)	31.6 (2.05)	32.3 (2.11)	0.34
Gender			0.23
Male	45 (18.9%)	56 (23.4%)	
Female	61 (25.5%)	67 (28.2%)	
Qualification			0.19
Doctorate	0 (0%)	0 (0%)	
Master	12 (5.1%)	7 (2.9%)	
Bachelor	102 (42.7%)	97 (40.6%)	
Diploma	13 (5.4%)	8 (3.3%)	
Area of specialty			0.27
Medical-surgical	43 (17.9%)	54 (22.6%)	
Intensive care units	21 (8.7%)	27 (11.3%)	
Orthopedics	22 (9.2%)	17 (7.1%)	
Maternity	13 (5.4%)	18 (7.5%)	
Other (ER, ENT, OR)	14 (5.6%)	10 (4.2%)	
Years of experience M(SD)	8 (1.34)	7 (1.11)	0.42

3.2 Skills of Pressure Ulcer Classification

The nurses' skills in being able to correctly classify PUs were very poor at the pre-test phase (Table 2). The results of an independent t-test indicated that there was no statistically significant difference $t(237) = -1.53$, $p=0.23$ between the mean scores of the experimental ($M=7.8$, $SD=1.92$) and the control group ($M=6.4$, $SD=1.76$) regarding the nurses' ability to classify PUs correctly; both were low (Table 2).

At the post-test, the situation was reversed, and the independent t-test demonstrated a statistically significant difference between the two groups $t(237) = -1.19$, $p=0.03$. The experimental group showed a higher mean score for PU classification skills ($M=16.1$, $SD=1.59$) compared to the control group ($M=10.4$, $SD=1.44$) (Table 2).

Table 2: An Independent t Test to Compare PU Classification Skills between the Experimental and Control Group at Baseline, and Posttest

Characteristics	Total Group (n=239)		t(93)	P value
	Experimental group n=119 M (SD)	Control group n=120 M (SD)		
Pretest for PU classification	7.8 (1.92)	6.4 (1.76)	-1.53	0.23
Posttest for PU classification	16.1 (1.59)	10.4 (1.44)	-1.19	0.03

To compare the results of the pre- and post-test for each group, a paired t test was used. The results confirmed that the mean scores of PU classification skills at the post-test were significantly higher than those at the pre-test for both the experimental group ($t(237)=-1.12$, $p=0.01$) and the control group ($t(237)=-1.73$, $p=0.04$) (Table 3). This suggests that nurses' skills were significantly enhanced after the provision of both types of teaching. However, as presented in Table 2, the independent t-test verified that e-learning is significantly more effective than the traditional method of education in improving PU classification skills.

Table 3: Paired t Test to Compare PU Classification Skills in the Pre- and Posttest of Both Groups

Characteristics	Pre-test, M(SD) M(SD)	-Post-test, M(SD)	t(237) (pre-test and post-test)	P value
Experimental group	7.8 (1.92)	16.1 (1.59)	-1.12	0.01
Control group	6.4 (1.76)	10.4 (1.44)	-1.73	0.04

4. Discussion

The current findings suggest that Jordanian nurses' skills in PU classification are not up to the required level. This weakness might come from inadequate knowledge since Jordanian nurses have inadequate training on PU classification tools, as a consequence of the absence of PU education in the Jordanian nursing program curriculum. Thus, extensive training is required if consistent results are sought. Nevertheless, the nurses' skills were improved significantly after training was delivered, whether through the e-learning program or the traditional lecture. It was shown, however, that a greater benefit was provided by the e-learning program as nurses in the experimental group demonstrated more significant improvement than the control group at the post-test. These results coincide the results of Morente et al. (2014) who demonstrated, in a randomized controlled trial, that an e-learning program for PU assessment and diagnosis was more effective than traditional on-campus teaching on the same topic for undergraduate nursing students. Students' mean scores in the e-learning group improved significantly compared to the scores of the conventional teaching group.

In Beeckman et al (2008) work, there was no statistically significant difference between nurses' skills of PU classification after both types of teaching. While nurses students' skills in the e-learning program improved significantly. The authors explained this based on the assumption that students had more experience with computers than nurses, and that nurses lack familiarity with computer application programs. Thus, the familiarity of nurses with computer technologies should be taken into consideration before e-learning programs are implemented (Beeckman, et al., 2008). However, there is a threat to the external validity of Beeckman et al's (2008) study due to its use of a convenient sample. The current one, by contrast, uses a quasi-experimental design. However, other scholars have presented findings that are not exactly in line with the current work. A systematic review of 11 randomized controlled trials was conducted to evaluate the effect of e-learning programs on nurses' and nursing students' knowledge, skills and satisfaction (Lahti, Hatonen, & Valimaki, 2014). The authors found that four trials demonstrated better improvement in knowledge linked to the e-learning programs as compared to traditional teaching. However, the difference was not statistically significant ($p=0.39$, MD 0.44, 95% CI -0.57 to 1.46). On the whole, no statistically significant difference existed between the e-learning and traditional techniques.

In areas other than PU, there is some evidence of the benefit of e-learning. Spiva et al (2012) conducted a study to verify the effectiveness of an e-learning program on nurses' knowledge and confidence in electrocardiogram analysis. The findings showed statistically significant differences in knowledge and confidence after subject participation in the intervention. Similarly, Moore et al (2012) carried out a study to evaluate an online educational program designed to enhance the skills and knowledge of healthcare staff caring for patients suffering from mesothelioma. The findings proposed that the developed program was satisfying and improved the nurses' skills, confidence, knowledge and ability to support patients suffering from the disease.

A further study was conducted to evaluate the effect of using an e-learning program compared to a conventional lecture in terms of knowledge gained, attitude, and opinion (Abdelaziz et al (2011)). Students who utilized the e-learning program were more satisfied, and found it more effective than their counterparts. They extended their understanding of the themes covered, and their computer skills had been enhanced.

In summary, the present work has demonstrated that an e-learning program was able to improve nurses' skills in classifying PU correctly.

This supports the claims made by several other studies presented above that the adoption of e-learning tools was more effective than traditional methods of teaching. Added to this, the development of computer and internet technology means that e-learning is increasingly available (Stephenson, Brown, & Griffin, 2008), and increasingly used (Farrell, 2006) in many higher education institutions around the globe. It has therefore been proposed that every health education curriculum should have at least one e-learning component (Farrell, 2006). Hence, the current research brought to the surface some recommendations and implications. E-learning should be integrated into nursing education programs and curriculums.. However, in order for nurses to derive the greatest benefit from e-learning, it is important that their IT skills are sharpened first. Replication of this study on a larger scale is recommended to scrutinize whether or not the significant results can persist. A longitudinal design exploring the effect of e-learning on PU classification over time could be rewarding.

5. Limitations

One of the main limitations of this work is the use of two-dimensional photographs of PUs. In practice, this could be misleading. The photos are unlike real PUs, since they give a static image of the wound, and no further assessment can be performed, which could make grading difficult and affect the accuracy of classification.

6. Conclusion

Nurses in Jordan have inadequate PU classification skills. Although both traditional teaching and e-learning enhance participants' skills of classification, the latter has a superior impact. This study proves that using e-learning programs as a type of nursing education shows potential, as an organized, flexible, and dynamic technique.

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