

The effectiveness of using blended ultrasound training in obstetrics and gynaecology skills and on competencies of trainees

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1 Introduction

Changes in medical training and culture have reduced the acceptability of traditional apprenticeship style training and replaced it with virtual reality simulators. These simulators are considered as an educational method that allows trainees to practice techniques without consequence (Modell J et al, 2006). In addition, to reduce potential risk this may be associated with training on real patients. It helps develop standard and optimise a systems. Although simulation is relatively new to medicine, simulators have been used extensively for training and assessment in some domains e.g. endoscopic procedures, anaesthesia and surgery (Reznick et al, 2006). Therefore, training in ultrasound requires specific courses built on experienced instructors, adequate lectures and skill-stations. The availability of specifically designed mannequins the implementation of learning systems and course regulations following specific recommendations, would allow for the effective training of a huge number of health care professionals. In order to enhance trainees' motivation and satisfaction of training, blended learning has established a didactic approach to medical education worldwide to overcome the problems of variable tutor quality, online learning and practical workshop to encourage the trainees to be independent learners.

Simulation is a general term for an interactive educational strategy that has been shown to be highly effective in the qualification of professionals working in emergency conditions (Fried et al, 2004). Similarly, new simulation systems, including sophisticated mannequin and computers, represent an important step ahead in technology as well as in medical training. Blended learning generally is learning that is facilitated by the effective combination of different modes of delivery, models of teaching and styles of learning including lectures, group workshop, tutorials and other activities. Therefore, the aim of this study is to evaluate the effectiveness of using blended learning in improving the trainee's skills in obstetric and gynaecological sonography. In this study, the participants who were enrolled in 3-day, short structured ultrasound course will be asked to demonstrate their ultrasound skills on day 1 in order to measure their baseline skills using the simulator before they undergo structured training using e-learning, small group teaching and supervised ultrasound practice on mannequins. Their skills are assessed again using the same simulator on (day 3) as a post- test to measure their improvement. This assessment protocol that formed as pre- and post test section. Will the acquisition of ultrasound scanning skills after training within a blended learning curriculum circumvent the need for training in a conventional way? This evaluation and assessment is an initial effort to assess a new teaching methodology related to sonography and its affect on trainee learning outcomes and behaviours. Thereby, establishing whether blended learning can be used as a method in training to improve trainee skills in a short period of time.

2 Background and objectives of study:

Critical literature review: Medical simulation is a rapidly expanding area of medical education. A typical example of the delivery method of blended learning would be a combination of technology-based materials and face-to-face sessions which are used together to present the curriculum (Worthington T, 2008). Simulation and blending learning may play a role in curriculum to enhance the educational process and to improve and make the learning environments more efficient. Many studies have attempted to prove the effectiveness of using blended learning and simulation in training (Aggarwal, 2007).

The overall aim of this research is to evaluate the enhancement of trainee's skills in a form of pre- and post test after using blended learning curriculum to achieve optimal ultrasound scanning of both obstetric and gynaecological applications, has opposed to contact with real patients. That relies on the potential of this curriculum and how fast it would improve scanning skills by trainees. The enhancement of the performance criterion by assessing the trainee before and after practicing would be the most method to assess whether effective the blended learning technique could be adopted as a training program for obstetric and gynaecology sonography in the future.

The objective of this study is to evaluate the proficiency of the trainee's scanning skills after using the blended learning technique by:

- (a) Determining the baseline experience level of each participant by assessing them through the pre-test method
- (b) Assessing each participant's skill prior and after utilising blended learning method and measure the improvement by post-test and make a comparison after recording (start- end points) of the pre- and post-tests results.

3 Principle research question:

Title of the study: *The effectiveness of using blended ultrasound training in obstetrics and gynaecology skills and on competencies of trainees*

Can the short structured ultrasound curriculum play a role in improving trainee's skills in obstetrics and gynaecology sonography to evaluate the use of blended learning as teaching technique.

The principle research question is:

Does the blended learning curriculum help in improving trainee's technical performance in ultrasound scanning?

Null Hypothesis:

“Short structured ultrasound training courses DO NOT improve core skills acquisition”

4 Methodology:

A comprehensive literature search (OVID with MEDLINE data base) under the headings of simulator, virtual reality, training, blended learning, obstetrics & gynaecology ultrasound were firstly undertaken electronically and then expanded by manual search of current contents and bibliographies from recent journals and reports.

Research design: This present study is commonly referred as a quasi experimental study, a design that could be also called non-equivalent groups design. This required a pre- and post test for comparison groups and measure the required skill improvement. Accordingly, the purposed research's strategy involves quantitative methods in a form of questionnaire in order to measure how trainees might respond to a new learning method in a particular way so that their performance will be developed after completing ultrasound training curriculum. Moreover, evaluation of the effectiveness of using blended learning technique in ultrasound training would be proven.

Sample size: The study population included **93** delegates who had participated in short structured ultrasound course of obstetrics and gynaecology (3-day form). These participants had undertaken this ultrasound hands-on workshop at the University Hospital of Wales (UHW), at Cardiff Medicentre in Cardiff and undergone the instructional course of obstetrics and gynaecological ultrasound. All the participants, after signing informed consents and completing the questionnaire, in (day 1), had been assessed as a pre-test to document and record their baseline skill and compare it with result of their post-test later. In (day 2), all participants received an identical tutorial on the workshop stations to familiarise them with the equipment and they trained practically by simulator and observationally by web-based learning.

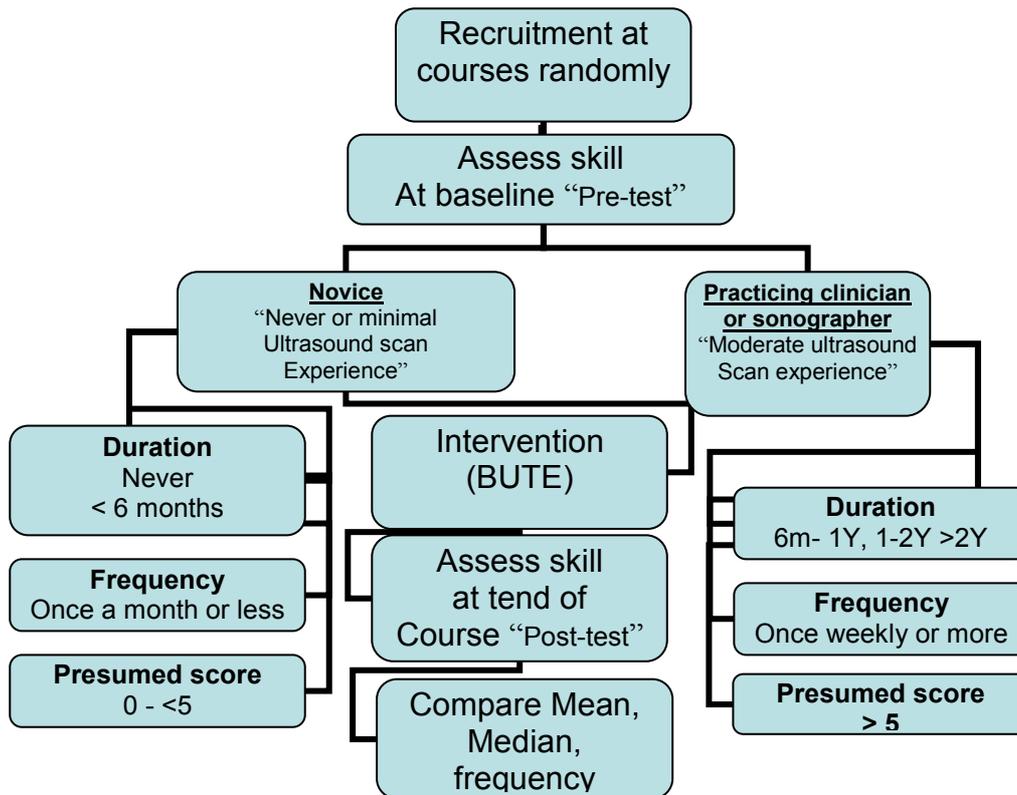
There was no control group in this study but regarding to delegates background, they sub-divided into ***novice*** who have the least or have never had any ultrasound experience and into ***practicing clinicians or sonographers*** who have a moderate scanning experience.

Protocol: Questionnaires: the questionnaire sheets were distributed to all delegates prior the workshop. The key is to ensure that survey questions are being answered in intended way to meet the research's objectives and help in analysing the data. Therefore, questions are formed as close-coded to capture the main idea of giving a real self-evaluation and expectation of the concept of improving skills by using blended ultrasound training.

Assessment: pre-test and post-test assessment methods used to evaluate the effect of using blended learning and estimate skill acquisition interaction between (start-end points) throughout the study. Topics are covered in assessment methods are:

- 1- Overall system operation: field of view depth, Gain, focus, zooming and annotation.
 - 2- Transducer: view the image in longitudinal and transverse plans, accessing window and sizing of display.
 - 3- Measurements in both gynaecology and obstetrics.
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This evaluation method will include a baseline evaluation, supervised hand-on practice and final evaluation. The descriptive graph illustrates the sequence of the assessment process.



Tool used in the study: web-based learning, Ultrasound machine and Transvaginal phantom for gynaecology and fetal phantom for obstetrics.

Data analysis: all the data are subjected to statistical analysis by using the statistical Package of the Social Sciences (SSPS) version 12.0 and Microsoft office Excel 2007 for calculating the statistical differences and measuring the variances.

5 Result:

Of 93 delegates enrolled in blended ultrasound learning courses, 40 enrolled with minimal (or never) scan experience while other 53 were with moderate experience in scanning. While 3 of participants were assessed with negative outcome and one trainee completed pre-test but not post-test assessment and that has not included in the analysis.

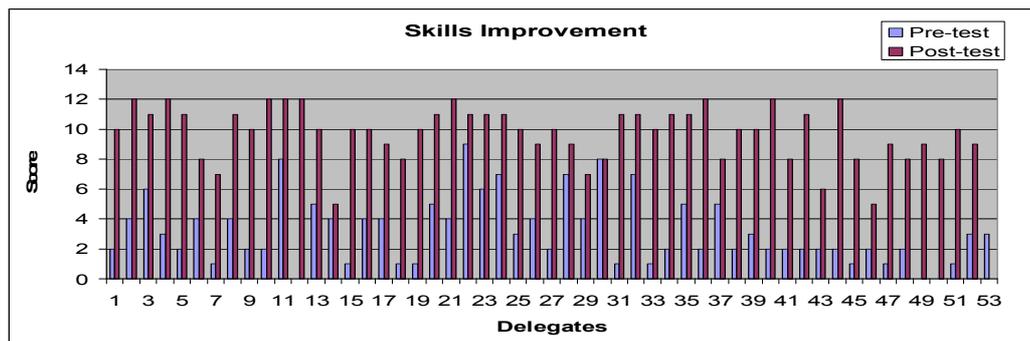
Both groups of Novice and participants with experience; had shown improvement. There was statistically significant difference between (start- end points) of the study which indicated as:

- Pre-test: a mean of 4.16 with SDs. 0.31
- Post-test: a mean of 9.61 has been increased while SDs. 0.22, *p-value*= 0.00
- Overall % of delegates who were improved from **35%** into **80%**

So, Means were increased from 4.1 (pre-test) into 9.6(post-test) whereas SDs has been reduced from 0.3 into 0.2. Mean and SDs have been given to indicate the variability of the data.

6 Discussion:

This study aimed to evaluate the enhancement of trainees' skill after undertook blended ultrasound training. All delegates' assessment represents a significant improvement on the mean score. This graph illustrates the pre- post test result for each delegate and shows the frank skill improvement.



7 Conclusion:

This study has shown that pre- and post tests assessment method can be used to measure a change in practice and indicate the trainee's skills which need further training to be improved. In addition, it did show statistically significant in skill improvement

8 Ethical consideration:

This study will centre around candidates who have already applied and participated in the ultrasound courses which run at Cardiff Medicentre, UHW several times a year throughout 2009. These training courses are held to improve candidates scanning skills in ultrasound by using blended ultrasound training. Therefore, there will be no associated clinical risk the evaluation of the scanning will be assessed by using mannequins instead of scanning real patients. Ultimately, this research will not involve any kind of treatment or require any clinical intervention because no patients are recruited. These ethical issues do not arise and neither NHS R&D approval, nor NHS Ethics committee approval are required. Each participant will be given a written consent form and information to clarify the aims and methods employed for this research. Each participant would be allowed to refuse or withdraw their participation in the study at any time, without any negative consequences to themselves.

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