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Electronic Learning Management System Integration Impact on Tertiary Care Hospital Learners' Educational Performance

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This is to certify that the doctoral study by

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Abstract

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MSN, Glasgow Caledonian University, 2005

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Technological innovations have been shown to improve the quality of health information and improve safety in health care systems. The purpose of this project was to offer hospital nurses a more flexible and practical alternative to education and training than the traditional face-to-face method, supporting nurse educators in overcoming many of the obstacles in responding to nurses' needs in the clinical areas. This project used a randomized, 2-group posttest-only experimental design to measure the effect of treatment at a targeted hospital. The experimental group received a new instructional approach using an Electronic Learning Management System (ELMS) and the control group used the site's traditional standard method; both groups completed the Posttest Knowledge Assessment. The study population consisted of registered nurses who had attended the project site's Safe Blood Transfusion Practice program over a period of 1 month. There were no significant differences between the 2 groups' members' gender, age, level of education, or nursing experience. Data analysis showed a significant ($p < .00$) difference between the 2 groups' posttest scores, indicating that the participants who used the ELMS attained a higher median knowledge ($M = 89.39$, $SD = 9.26$) than did participants who received traditional, face-to-face instruction ($M = 76.85$, $SD = 10.628$). These results suggest that ELMS-based learning is a more effective method of instructional delivery that could effectively replace many of the traditional face-to-face education programs. Implementing this innovative system will create positive social change on the targeted hospital by improving health care delivery. The application of the finding would support clinical educators to improve educational delivery to their clients at the clinical areas.

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Dedication

I dedicate this work to my lovely daughters, to my son (Rawad), and mostly to my wife, without whose support and sacrifices I would not have succeeded. Special feelings of gratitude to my loving parents whose words of encouragement and prayers will always remain with me. I am very grateful for having you all by my side through this long journey.

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Section 1: Overview of the Evidence-Based Project

Introduction

Rapid information communication and technology (ICT) development has significantly impacted the entire healthcare sector. Health informatics, especially the adoption of electronic health records (EHR), is in continuous development and has become an essential component of caring for patients in any health care facility (Larsen & Vincent-Lancrin, 2005). Information communication and technology therefore play a significant role in health care teaching and learning. Development in educational technology as electronic learning, has shown significant flexibility in terms of time and distance/location (Ayub & Iqbal, 2011; Ministry of Education New Zealand, 2009; Sun, Tsai, Finger, Chen, & Yeh, 2008).

Resisting technological innovation in healthcare is becoming harder than ever. Technology in health care has become one of its major irreplaceable components that involve all aspects of patient care. Technological innovations have also invaded nursing care and its use is an essential competence for nurses (Hill, 2013). Technological innovations have proved to improve the quality of health information, improve safety in the health care system and even lower costs of care (Herzlinger, 2006). It is therefore important that nurses master these innovation in order to perform their roles efficiently in any health care facility.

Electronic learning, or e-learning, is arguably the most significant change to occur in nursing education (Button, Harrington, & Belan, 2014). It has a demonstrated capacity to support sharing of knowledge, distant access, teamwork, and coordination to a broad audience over wide areas (Ayub & Iqbal, 2011; Moore, Dickson-Deane, & Galyen, 2011; National VET e-Learning Strategy, 2014). However, the willingness and acceptance to use these technological innovations by staff remains the primary

determinant of its success (Holtz & Krein, 2011). It is crucial to assess staff acceptance of technology and assess their resistance to the success of any technological improvement (Kummer, Schäfer, & Todorova, 2013). Health care professionals concerns and fears have been found to play a significant role in the success of information technologies (IT) projects. According to Walter and Lopez (2008), "Only with greater acceptance by physicians and other health professionals alike, can IT play a central role in improving health care delivery" (p. 213). Identifying the sources of resistance and developing strategies to enhance the IT benefits can improve the users' overall acceptance (Walter & Lopez, 2008).

Problem Statement

Coping with the clinical demands and challenges at the bedside at the targeted hospital is becoming harder over the time. Shortages of nurse educators, hospital expansion, increasing nursing staff, and increasing workloads all have made traditional methods of clinical education less effective in the targeted hospital. Nurses in the targeted hospital are currently spending considerable time to access and complete training and education essential to their clinical practice. In order to train, they first need to search for the desired program in the nursing education schedule, manually fill and send the registration form, and wait for a response for approval depending on the vacancies and eligibility. After receiving the confirmation, participants have to travel by bus to the nursing education location (within the medical city), then sign in and sit for face-to-face educational program. After completing training, they must also wait for certificate dissemination (about two weeks) and collect these in person from the nursing education center.

This project evaluated a proposed new approach using an electronic learning management system (ELMS), which was believed to ease the access to clinical

education significantly and shorten the time to complete the desired program. The evaluated ELMS implementation offered significant flexibility with space and location that could make it a very practical alternative to many of the current programs adopting the traditional approach. This new approach was intended assist in resolving the obstacles in disseminating and distributing updated knowledge and training to hospital staff, which had become very challenging. For example, disseminating training for new practice guidelines concerning safe blood transfusion through the current face-to-face approach has consumed more than one year of weekly sessions, nevertheless, according to thr nurse educator facilitating the program, many of the hospital nurses did not have the chance to attend.

The practice-education gap has been always a concern for nursing administration at the project site. Nurse educators in the targeted hospital are facing many obstacles to cope with the increasing demand for providing clinical education and training programs to more than 4,000 registered nurses. According to Benner, Sutphen, Leonard and Day (2010), it is becoming harder for nursing education to keep up with the rapid changes in the current practice environment. The new approach using the ELMS could support nurse educator in the targeted hospital to overcome many of the obstacles they are currently facing in responding to nurses' needs in the clinical areas. However, while adopting this innovative ELMS approach was believed to support nurses in many aspects, its impact on the nurses' education achievement needed to be measured and evaluated to ensure its efficiency in either replacing the face-to-face approach or providing a convenient alternative.

Project Objectives

The overall purpose of this project was to offer hospital nurses a more flexible and practical alternative to education and training than the traditional face-to-face method. Moreover, the project was designed to support nurse educators at the targeted hospital to overcome many of the obstacles they are currently facing in responding to nurses' needs in the clinical areas. This approach, if validated and adopted, will create a direct and positive change in the delivery of nursing education and nurses' clinical practice.

The primary objective of this project was to examine the effectiveness of a new innovative learning approach (ELMS) versus the traditional approach on educational achievement of registered nurses working in a tertiary referral hospital. This was accomplished by comparing the measurement of the nurses' educational performance post using the standard and innovative learning approaches in a given educational program. The specific program used to evaluate the impact of the new approach was the project site's Safe Blood Transfusion Practice program.

Significance/Relevance to Practice

Nurses are faced with many challenges to complete their recommended training needed to maintain safe and effective practice. For instance, nurses in the investigator's hospital are required to attend several educational programs and complete a set of clinical competencies within three months of their hiring (orientation period). Later nurses are needed to complete other unit-specific training and competencies. Time limitations and ease of learning access can only add stress and despair to nurses working in such tertiary-care facility.

Nursing care has been significantly changing over the years in contrary to nursing education methods that remain almost unchanged (According to

Niederhauser, Schoessler, Gubrud-Howe, Magnussen, & Codier, 2012). Nurse educators need to respond effectively and cope with the continuous clinical training and education demands from clinical areas. With these increased demands and others as hospital expansions and shortage of nurse educators, traditional methods of clinical education in the targeted setting are no longer matching the expectations. According to Bolton (2014), increased nurse workload, nursing workforce shortage, and other factors impose barriers to the nurse's ability to devote adequate attention to patient care.

A new proposed ELMS approach for clinical nursing education programs could be an appropriate alternative to that of the traditional one, and perhaps a more efficient learning system. According to Bolton (2014), hospital nurses need to spend as much time as possible with their patients. By making the learning accessible to all nursing staff at their clinical setting and through their intranet (hospital internal network), it is believed to considerably shorten the time currently spent on the traditional approach and eventually save valuable time needed in the clinical setting. Nurses with the new approach can complete the required education in their desired time and location. The new approach would give them the opportunity to have their certificates on the spot without going through the traditional routines. Clinical learning and education would become more accessible, feasible, and perhaps more satisfactory.

Clinical education is considered an essential component of the clinical nursing practices. Clinical educational programs in the targeted hospital were designed as a direct response to a patient need or a clinical need to ensure patient safety and quality of care delivered to our patients. Nurse educators are responsible for developing and conducting clinical education for more than 4,000 nurses in collaboration with clinical

resource nurses (CRNs)/Nurse Clinicians at the unit level. The current traditional clinical nursing education is exclusively delivered through face-to-face classroom education. Most of the learning contents are designed to be a part of the mandatory competencies that need to be met prior to its application at the bedside.

Blood transfusion training issues were brought to the hospital leadership's attention in 2015 after an incident that took place, followed by a fast root cause analysis. This incident was related to inappropriate patient identification and its details remain confidential; however, it led to a review of the staff preparedness which was discussed at the executive level. An administrative decision was therefore made to raise staff knowledge and awareness of the policies and practice guidelines that may prevent such events. This included a hospital-wide safe blood transfusion awareness campaign followed by an updated three-hour Safe Blood Transfusion Practice clinical training program.

The Safe Blood Transfusion Practice had a high-priority category of implementation for registered nurses working at the project site. The program was conducted in collaboration between the project site's nursing education center and the hospital's blood bank. Prior to this project, this program operated on a weekly basis using the traditional training approach. After this program had operated for several months, numerous questions were raised concerning the time consumed in disseminating this "updated" training for all nurses in the hospital. Another concern that was raised by nurse educators and managers was whether or not the participating nurses needed to attend the session on an annual basis, as the initial staff training required more than one year to cover all nursing staff.

Using the ELMS was predicted to make a positive difference in the clinical education and training. E-learning has made access to training and learning possible

from anywhere at any time (Ayub & Iqbal, 2011; National VET e-Learning Strategy, 2014). It can accommodate large numbers of nurses at the same time. New updates can be efficiently disseminated through the ELMS and be available to the targeted nurses in their clinical setting within seconds of its dissemination. Through the ELMS adoption, nursing education will no longer be limited by time and space nor by the availability of education faculty. Making this education method available would be of great value and significance to nurses working in the targeted hospital and was expected to create a positive change in the clinical education delivery methods, contents, and efficiency.

Research Question

This study was designed to measure the effectiveness of a new approach designed to provide nurses with essential instruction in safe blood transfusion practices. It was specifically designed to address the research question, "Is there a difference in knowledge achievement between nurses who complete the program using the traditional method and those who complete it using the new ELMS approach?"

Evidence-Based Significance of the Project

Nearly all health care professions are affected by the invasion of technology due to rapid advances in computer information worldwide. It is now very rare to find any healthcare practitioner who has not been involved in the utilization of these new technologies. Nurses' involvement in technology utilization in healthcare is not new. The most common health information technology used in health care is that of the electronic health records (EHRs) which, when used appropriately, can transform the healthcare system into a more efficient and safer one (Bowman, 2013). Utilization of health information technologies required the participation of all health care providers.

The 2013 E-learning Benchmarking Survey reported that 95% of the vocational education and training (VET) teachers and trainers reported using at least one of the electronic technologies in their training (National VET e-Learning Strategy, 2014). Such technology can offer nurses a great opportunity to overcome many obstacles and may save quality time that could be spent with patients (Bolton, 2014).

Several initiatives related to the technology utilization in health care had been put into action. For example, the Initiative of Technology Informatics Guiding Education Reform (TIGER) in North America was one of the largest initiatives that focused on providing electronic health records for all citizens (DuLong & Gassert, 2008). Nevertheless, it is not the presence of technology alone that can promote high quality of safe care, but rather the way this technology is utilized. In the current project, the utilization of new technological approach designed to serve the nursing staff in the clinical area and nursing education in the targeted setting was expected to be unique and invaluable.

Nursing employers expect new graduates to deliver safely and competent care for acutely ill patients immediately after licensure, a time when they are still undereducated about the demands of clinical practice (Benner, Sutphen, Leonard, & Day, 2010). Innovative methods for clinical education are vital to meeting the needs of nurses in the clinical areas in an efficient manner. Developments in technology have an extraordinary potential for transforming education to meet the growing need for customized, on-demand learning (Nafukho, 2007). Although it may differ from one place to another, many studies have shown nurses' satisfaction with their jobs to be as low as 40% (Aiken et al., 2001; Sochalski 2002), suggesting that efforts that improve focus on nurses' job satisfaction via electronic learning (E-learning) have a significant potential for positive change.

Several other studies have reported a positive influence of e-learning on professional development. Larsen and Vincent-Lancrin (2005) found that e-learning is a promising method for improving the quality the effectiveness of learning and tertiary education. Pullen (2006) conducted an evaluative case study of online learning for healthcare professionals, reporting that electronic education is favored by healthcare professional as it offers greater flexibility in delivering training and education. This flexibility includes access to training and learning from anywhere at any time, as well as managing learning around personal commitments and work (National VET e-Learning Strategy, 2014).

Implications for Social Change in Practice

Larsen and Vincent-Lancrin (2005) questioned whether ICT can revolutionize health care education. The increased use of advanced ICT in education is becoming clearer over the years. Many educational institutions nowadays have adopted the online or distance learning as a new model for delivering education for all or part of its programs. Using the Blackboard LMS and other forms of computerized digital learning, online access is becoming part of the traditional as well as the virtual academic programs. It is becoming unusual to find an academic educational facility that has not been affected by ICT (Oguta, Egessa, & Musiega, 2014). However, the speed of adopting these technologies is very different from one place to another. In the healthcare sector, we are usually very reluctant to adopt any new approach simply due to the fear of influencing patient safety. Nevertheless, this same reason could be used to support the utilization of these technologies when sufficient evidence is present to ensure the role of a technology in securing and improving patient safety.

No matter how many studies in the literature supporting the adoption of new methods and approaches using electronic learning, health care facilities will remain

very cautious and resistant to it. This is simply because education field, and for many years, was not easily moved by experimentation (Whitehurst, 2012). For an innovation to be successful and applicable, it is imperative that evidence supporting its adoption are collected from the same health care setting where the innovation is to be conducted. Validating research in literature can be accomplished simply by replicating it in this unique setting. The factors of money, availability of faculty, and access to these technologies can also play an important role, especially in the developing countries.

If integrating ICT to replace some of the on-campus classes, it can play a significant role in tackling the shortage in teaching faculty. Electronic learning is capable of providing knowledge and education to a large number of learners, over a very wide space and distance (Ayub & Iqbal, 2011). Adoption of ICT could take the forms of electronic learning or online learning as a replacement for face-to-face classroom settings. Learning at a distance can be more learner-centered, self-paced, and problem-solving based than face-to-face teaching (Ayub & Iqbal, 2011). The application of such technology was predicted to create positive social change in the hospital and by revolutionizing the communication between the nursing education department and the nurses in the clinical areas.

Definitions of Terms

Information literacy: The facility to recognize the need for information, determine the extent of information required, access information efficiently, critically evaluate information and its sources, classify, store, manipulate, and redraft information collected or generated and incorporate selected information into their knowledge base (Bundy, 2004).

Information and communication technology (ICT): Technology used to handle information and aid communication (Dictionary.com, 2008). ICT includes the Internet, wireless networks, cell phones, and other communication mediums (Conrick, Hovenga, Cook, Laracuente, & Morgan, 2004).

E-learning: The process of delivering learning content via computer-mediated communication media. E-learning, or electronic leading, can be delivered via any electronic media, including the Internet, intranets, extranets, satellite, broadcast, video, interactive TV, and CD-ROM. It involves some form of interactivity, including online interaction between the learner and their teacher or peers (Ministry of Education New Zealand, 2009).

Learning Management System (LMS): A software application designed for the management of training and educational programs. An LMS combines the administration and documentation of learning initiatives, user registration, tracking courses, recording data from learners; and providing reports to management (National VET e-Learning Strategy, 2014). LMs are designed to deliver, conduct collaborative activities, and track the progress of learners ("Learning management systems (LMS)", 2014).

On-line learning: Computer-mediated e-learning that is conducted via the Internet.

Knowledge achievement: In this project, the knowledge gained from an electronic or traditional face-to-face educational workshop or activity. In this project, knowledge achievement was measured using a posttest knowledge assessment tool.

Electronic Learning Management System

Electronic Learning Management Systems (ELMSs) are high-level electronic learning application software platforms designed for managing learning events and

training/educational programs for nurses in the clinical areas. This new approach intended to target the hospital's clinical nursing education programs. This ELMS is developed as an integrated strategic learning management tool that offers solutions for planning, conducting, and tracking the progress of learners and activities within the hospital.

Using an ELMS is believed, by the researcher, to ensure the delivery of the current clinical nursing training courses and workshops to a larger number of nurses in a more efficient and timely manner that best serve nurses in the clinical areas. It will provide the learning materials, assessment exams, evaluation forms, and certificates generation. Moreover, such system would enable educators to track learners' time of access, duration of access, completion of the module, assessment results, and evaluation results.

An ELMS provides a broad form of e-learning; however, most extent literature on educational tools, instruments, and measurements are not applicable to ELMSs. After a thorough literature search, and after the revision of more than a dozen of tools had been used in literature, I concluded that ELMSs remain unique in several ways. ELMSs are not continuous education tools and are not opened to the public. It is not designed for pre-graduate students, but rather to hospital employees. The ELMS is not only a source for information seeking, but rather it is a system for clinical learning and training that needs an account for accessing, contains assessment and evaluation tools, and generates certificates of completion. The ELMS will not be using the World Wide Web (WWW) rather it is conducted via the hospital intranet portal. It will be available through the hospital internal network (Intranet) which will enable all nursing staff to access it using the same personal Hospital email login details (username /password).

Once adopted it may affect the new nurses' readiness to complete their mandatory clinical educational requirements. With ELMS, nurses would be able to access the modules more efficiently without the need for the traditional bookings and registration. Time will no longer be spent on transportation (to Hospital Center of Nursing Education) as the system could be accessed from any place in the hospital through any computer (all equipped with intranet connection). Certification generation would be instantly generated post completion of the e-module and would no longer require extensive time for processing and collection. However, for the current approach to be adopted, the educational achievement needs to be measured and evaluated in compared to that of the current traditional approach.

Assumptions and Limitations

In this project, it was assumed that the participants registered for Safe Blood Transfusion Practice have not attended this program before especially that it has not been running for a long time. This assumption was supported by recruitment guidelines advising nurses to participate only if they were taking this course for the first time.

Education achievement term used in this paper is assumed to have the same meaning of Knowledge Achievement as defined in the Definition of Terms in this paper. Moreover, in this project the term *student* refers to those nursing students who are still studying in the college/university and have not yet been licensed to practice nursing independently. On the other hand, the term *learners* in this paper refers mostly to those hospital employees who are attending the educational program or any learning activity.

ELMS are used in a form of electronic learning that is rarely described in the literature using the term ELMS. While the Electronic Learning Management System

is generally assumed to be a form of electronic learning, e-learning, or Learning Management Systems (LMS), there are several major differences between them. The extreme majority of e-learning and LMS studies used an online system accessible via the World Wide Web, which was not the case with the ELMS used in this project. The system under study was used by registered nurses who were currently employed as full-time nurses at the hospital, unlike many studies' focus on undergraduate students in an academic setting and may not be typical for those working in a hospital setting.

Summary

Electronic learning remains a very new approach to nurses in the targeted hospital. The innovative approach (ELMS) is a very promising tool that would allow nurses to participate in clinical education from a distance. Compared to face-to-face approach, ELMS would make educational activities accessed and completed in a more flexible and practical fashion. Applying the new educational technological approach in our hospital will have an influence on sharing of knowledge, distant access, and delivering needed education to a large audience over vast areas. In this project, the impact of the new innovation on nurses' educational achievement will be evaluated. It is believed to have exquisite potentials to be adopted by the targeted organization creating a positive social change in the hospital care setting.

Section 2: Review of Scholarly Evidence

The review of scholarly evidence discussed in this section includes specific literature, literature related to negative aspects of e-learning and other general literature. Negative aspects of e-learning will also be included in this section. This section is designed to demonstrate sufficient evidence in the literature of the negative aspects reported when using different forms of electronic learning. An extensive search of the related literature was conducted through the Walden University e-Library and the Hospital library data base. Database searches were conducted via Athens and EBSCO, and included CINHAL (Cumulative Index of Nursing and Allied Health Literature), PUBMED, and MEDLINE. The search keywords were: electronic learning, e-learning systems, online learning, distance learning, educational technologies, learning management systems, and Kingdom of Saudi Arabia.

Specific Literature

This section discusses selected studies that were especially relevant to this project. It includes studies that focused on electronic learning significance and its influence on clinical practice. Globally, e-learning has been introduced to nursing curricula in a number of Western countries including Australia, Canada, Greece, Ireland, New Zealand, the United Kingdom, and the United States (Button, Harrington, & Belan 2014).

Online learning offers the flexibility and the ability of being self-paced. Kelly, Lyng, McGrath and Cannon (2009) investigated the students' knowledge attainment, learning clinical skills and performance in online learning videos compared with the traditional lecturer methods. The primary goal of adopting this educational innovation was to improve the methods of teaching large numbers of nursing students the assigned clinical skills. Students enjoyed the online learning and its environment in

compared with the traditional classrooms. The study findings supported the use of the new educational innovation.

The aspects of online learning noted by Kelly et al. (2009) as having the most positive response were the flexibility of this method. The study used a quasi-experimental posttest only control group design. Student's attitudes were evaluated using a questionnaire distributed to the entire class at the end of the module. Of the outcome evaluation, the sample was distributed equally between the control group and experimental groups who were instructed to view the instructional videos relating to the three skills prior to a scheduled period of supervised practice. While there was randomization in assigning participants to the control and experimental groups, there was no randomization when selecting the sample. In addition to this, the researchers did not conduct a pretest.

The main weakness of Kelly et al.'s (2009) study was the sample size, which affected the statistical analysis and any generalization of results. Only 14 students out of 204 volunteered for the outcomes evaluation phase of the study and were assigned randomly to the control (n = 7) and experimental (n = 7) groups. Four students withdrew later before the assessment. The researchers were from the teaching faculty and were well known to the students, which might have had a significant influence on the participation as well as on their performance. However, although these findings were not enough to prove the dominance of the new innovation in compared to the face-to-face demonstration for teaching, they suggested that it is at least as effective. The researchers recommended complementing, rather than replacing, traditional face-to-face lecturer demonstrations.

Literature in the e-learning field in Saudi Arabia, the country in which the project site was located, is still rare (Alkhalaf, Drew, & Alhussain, 2012). However,

Alkhalaf, Drew and Alhussain (2012) assessed the impact of e-learning systems on learners in two different universities in the Kingdom of Saudi Arabia (KSA). The survey explored the participants' perceptions concerning their performance using their current e-learning systems and focused on the depth of learning, student productivity learning pace, and their satisfaction. The main finding was that e-learning systems have a positive impact on learning. This study was a descriptive survey that explored the impact of e-learning from the perceptions of the learners. All participants were students of the two universities and the e-learning materials were part of their curricula.

Alkhalaf, Drew, AlGhamdi and Alfarraj (2012) investigated the attitudes and perceptions of the faculty members of e-learning in KSA. The study was in a purely academic setting and was descriptive in nature. Alkhalaf et al. found that faculty had positive attitudes towards eLearning systems in higher education, and that such systems help faculty members in their job performance and organizing their education.

Shachar and Neumann (2003) conducted a meta-analysis on the academic performance differences between traditional and distance education in the United States. This study focused on the final course grades in 86 studies with about 15,000 students, from 1990–2002; the study population consisted of students registered in structured academic programs .Shachar and Neumann found that two-thirds of the students of distance education scored higher than those of the traditional approach. The study had very strict inclusion criteria and only included experimental and quasi-experimental studies that have no clear methodological flaws.

Button et al.'s (2014) exploration of e-learning and ICT in nursing education identified 346 peer-reviewed, primary research studies published between 2001 and 2012. Twenty-eight studies were included in the review after examination for the direct relevance, inclusion and appraisal criteria studies. The criteria for selecting studies included only primary research studies published in English between 2001 and 2012 that focus on electronic learning involving nursing students and educators. Advancements in information technology were found to have significant implications for nursing students as well as nurse educators worldwide (Button et al., 2014). These implications include the technology that nurses are expected to work with on a daily basis during their career. Button et al. (2014) recommended the urgent need to work on measuring the impact and effectiveness of e-learning on students and educators including their perceptions towards it. The main drawback of this study was that it have not included post-graduate nurses and remained limited to students and educators of undergraduate programs. Applying such results on nurses working in a hospital setting may need to be treated with high caution.

Pullen (2006) investigated the effectiveness of online learning, finding that online continuing professional education allowed healthcare professionals to learn topics most relevant to their professional practice at their own preferable time. Online learning offers healthcare professionals greater flexibility while accommodating their regular busy schedules. It was very clear that healthcare professionals favored the online learning as it allowed them to utilize it anywhere and at any time.

The National Vocational Education and Training (VET) E-learning Strategy have recently published the results of the 2013 E-learning Benchmarking Survey which have focused on use and impact of e-learning in education and training (National VET e-Learning Strategy, 2014). The survey included the responses of 677

Australian Registered Training Organizations (RTOs) and 1,991 VET teachers and trainers. E-learning was found to continue being more widely and more intensely incorporated into VET activities across the country. Using technologies in training by teachers and trainers reported being increasing and using e-learning continue to be utilized in a wider range of training activities (National VET e-Learning Strategy, 2014). 48% of the Education and Training activities were found to involve formal e-learning. Moreover, 95% of the VET teachers and trainers reported using one or more technologies in their training 90% of them were found to support the use of e-learning. On the other hand, 71% of RTOs reported using onsite interactive learning resources (compared to 63% in 2011) and 45% of them reported the use of Learning Management Systems (LMS). Teachers and trainers showed confidence in using technology in different ways (National VET e-Learning Strategy, 2014).

General Literature

Several studies have proven that ICT helped students to communicate better with their educators rapidly and receive responses in a timely fashion (Smith, Passmore, & Faught, 2009). Smith, Passmore and Faught (2009) conducted a cohort study considered to be the largest trial of its kind (N = 30,616) and repeated it after five years in the USA and Canada. Nearly all students stated that ICT was *ubiquitous* in their lives. It enabled them to access their educators and receive responses via email and discussion forums rapidly and in a timely fashion.

Other advantages of electronic learning and the integration of ICT were reported by Larsen and Vincent-Lancrin (2005). It included the expanding and widening the accessibility to tertiary education and training, improving the quality of education, and reducing the cost. ICT was found to give more opportunity for new participants to be involved in tertiary education in compared to the face-to-face

model. This applies most to working students and adults, and for people living in rural areas. According to Larsen and Vincent-Lancrin (2005), with the help of ICT, learners will be able to study wherever they are and at the time that suits them rather that what is been assigned and booked for classroom traditional education. Large numbers could access education the ICT materials at the same time and in contrary to the face-to-face learning experience, there is no restraint to location, time and space. ICT may reach a scale of participation that would be in many times unfeasible via face-to-face learning.

Contrary to many other studies, Larsen and Vincent-Lancrin (2005) sees that e-learning investments in tertiary education could be cost-effective depending on the business model, the number of students and topics. This is possible when it replace parts of the on-campus teaching activities. In addition, once developed e-learning consumes zero paper collections, does not need manual correction of exams and minimal tutoring and interference from the educators is needed.

Negative Aspects of E-Learning

Many obstacles might face the integration of electronic Learning into the traditional system. Cost remains to be one of the main obstacles hindering the adoption of electronic learning include. Chapman (2010) estimated 79 production hours are needed by a computer programmer to develop one online hour basic e-learning package that includes text, content pages, PowerPoint visuals, graphics, simple video, and test questions. Nevertheless, the main barriers to adopting electronic learning include lack of training, shortage of interested and skilled educators, poorly designed courses, deficiencies in required costs, and the lack of time for developing and facilitating such programs (Childs, Blenkinsopp, Hall, & Walton; 2005) .

Moule, Ward and Lockyer (2010) investigated the Nursing and healthcare students' experiences and use of e-learning in higher education, finding that the staff had very little time to undertake any e-learning development. Furthermore, Blake (2009) investigated the attitudes towards and use of e-learning among staff. The survey results showed that most staff were in favor of the use of technology in teaching and learning. However, many expressed a lack of time concerns. The validity of the tool used after adaptation was not tested nor piloted. Sample size remains relatively small (about 100).

One of the obstacles to adopting e-learning is the educators themselves. The amount of time needed for E-learning resources to be developed and conducted could be the Educators' greatest concern. Nguyen, Zierler and Nguyen (2011) conducted an online "Survey of Nursing Faculty Needs for Training in Use of New Technologies for Education and Practice". Results showed that 69% of faculty reported a need for additional training with distance learning and informatics tools. Use of distance learning technologies was associated with lack of technical and financial support. The study had several limitations including the validity of the tool used and the lack of sample characteristics. Educators underestimate the time required to develop a one-hour course of e-learning (Nguyen, Zierler, & Nguyen, 2011). Similar results were reported in earlier study by Crews, Miller and Brown (2009) where the preparation of electronic based lectures needed more time than traditional ones.

Moreover, Button, Harrington, and Belan's (2014) literature review showed that nurse educators have emphasized their need for computer information technology staff development to increase their role in information technology use. Increased time and skill demands on nurse educators to adapt their education to incorporate E-learning, were clearly identified. Several other studies have revealed the challenges of

time and increase of workload when the new technologies are introduced without taking such factor into consideration (Hartman, Dziuban, & Brophy-Ellison, 2007). This was reflected in a study by Smith et al. (2009) who interviewed nursing instructors by telephone or through face-to-face in order to investigate the experiences in online learning. The main concern was found to be directed at the effectiveness of assessment and the time needed to develop these courses. ICT literacy was also reported among nursing staff. Scott, Gilmour and Fielden (2008) pointed out that the nursing professionals' level of information literacy would have a significant impact on the level of patient care provided. Some of the attitudes towards the use of technologies could be related to administrative barriers too.

Eley, Fallon, Soar, Buikstra and Hegney (2008) explored nurses' current information, their computer technology knowledge, and future training needs. A questionnaire was distributed to 10,000 Australian Nursing Federation members and showed that 86.3% of respondents have been using computers as part of their work-related activities. Only 4–17% of nurses had received adequate training. The nurses have considered that the employers were not encouraging the information and computer technology training, which also has been faced with the workload. Eley et al.'s (2008) survey had several limitations, including combining educators and RNs into a single category; students only represented 3% of the respondents. Similar results were reported by Crews et al. (2009), who found a lack of training and institutional support for the time taken by educators to learn and prepare new technologies.

Conceptual Models and Theoretical Frameworks

Starting change is not a simple process, and adopting a theoretical framework can help in decision-making and in having a clearer view of the path the project will follow in applying the change. Adapting the ELMS is a new approach for all hospital users. Therefore, it can be explicitly considered as an innovative method of learning (Yatigammana, 2014). When adopting technological innovation in health care organizations, two main theories on change which were used successfully in many studies and projects could be adopted, Kotter's change management model and Rogers' diffusion of innovation theory (Neumeier, 2013). For the current project, Rogers' diffusion of innovation theory has been found to be more relevant and is followed to improve the likelihood of the new innovation of LMS to be adopted.

The origins of the diffusion of innovation theory origin go back to 1903, when it was first discussed by the French sociologist Gabriel Tarde. In 1960, Everett M. Rogers proposed the theory in its current popularized way (Neumeier, 2013). Rogers's diffusion of innovation theory has been adopted and tested by many studies concerned with new technologies in different contexts:

- Isleem (2003) quantitatively examined the level of computer use for instructional purposes by educators in Ohio public schools.
- Medlin (2001) examined the selected factors that might influence a faculty member's motivation and decision to adopt new electronic technologies in classroom instruction.
- Jacobsen (1998) determined the adoption patterns and characteristics of faculty who integrate computer technology into teaching and learning in higher education.

- Less' (2003) quantitatively investigated faculty adoption of computer technology for instruction in the North Carolina Community College System.

The diffusion of innovation terms refers to the process that occurs when people adopt a new idea, product, practice or philosophy. This process was mapped by Rogers in phases where the first phase is when the innovation is initially adopted by few who were referred to as *early innovators* (Robinson, 2014). Those usually lead the development and start in spreading the word. Over time, according to this theory, innovations are adopted in different stages. According to Rogers, those adopters are categorized into five groups: innovators, early adopters, early majority, late majority, and laggards. These groups/categories were illustrated by Rogers in a bell-shaped curve with the percentage of each category as seen in the figure below (Figure 1.).

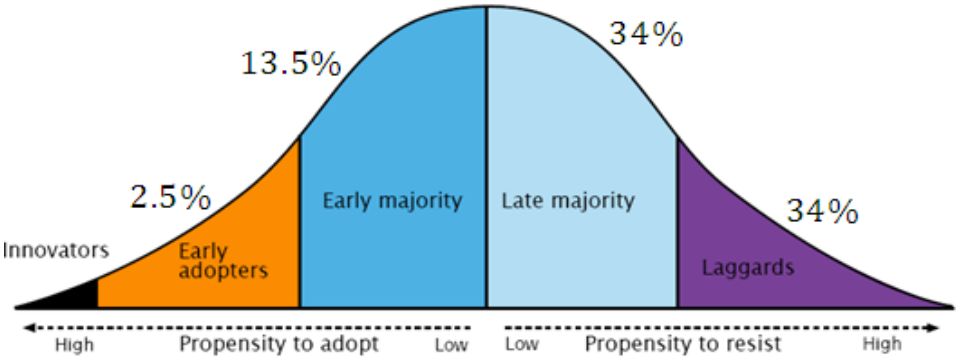

Figure 1. A chart showing a summary of the diffusion and innovation distribution. Adapted from "A Summary of Diffusion of Innovations" by L. Robinson, 2014, in *Enabling Change*, p. 4. Retrieved from http://www.enablingchange.com.au/Summary_Diffusion_Theory.pdf

The theory is mainly all about ideas, practice or object that is viewed as new which needs four main elements for diffusion or communication channels between the sources and receivers. These four main elements are (1) innovation, (2) communication channels, (3) time, and (4) social system. According to Rogers (1983), innovation is "an idea, practice, or object that is perceived as new" (p. 11). Such definition typically applies to the new ELMS approach for nursing education and training proposed proposed for the first time in the hospital. On the other hand, diffusion was defined as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 2003, p. 10).

The five stages of the Innovation-Adoption process are:

- Knowledge (awareness)
- Persuasion (formation of positive attitude)
- Decision (adopt or reject)

- Implementation (put into practice)
- Confirmation (effectiveness evaluated)

Adopting Roger's theory by the current project entails that the theory would be utilized in all the stages of the project. While the knowledge and persuasion phases have been completed, the project still needs to show its effectiveness in knowledge achievement before a decision is made to whether it would be adopted or not. Once achieved, the innovation of the new approach would be applied to a small group as a trial phase (piloting) and then generalized to all staff.

According to Rogers' model, the easier it is to see the benefits to the patient of the practice change, the more likely it is to be adopted (Kaminski, 2011). Rogers' Diffusion of Innovation theory has identified five innovation attributes that would have an impact on the acceptance of technology. These five attributes will be taken into account in the current project to ensure the new approach effectiveness and acceptability. These five innovation attributes, used evaluate the rate of the adoption, are the relative advantage, compatibility, complexity, trialability and observability (Rogers, 1995). Adopting Roger's diffusion of innovation theory would contribute to the achievement and maintenance of the desired positive change.

Section 3: Approach

This section provides an overview of this study research design, research methods, population and sampling, interventions, data collection, and analysis plans. It includes strategies used for data collection from both nurses of the controled and experimental groups, measures taken to protect the data and the nurses' privacy and identity. Moreover, ELMS instrumentation are presented followed by data analysis and evaluation plans.

Project Design/Methods

This study utilized a quantitative approach. Quantitative research is concerned with a pattern that can be particularly useful for investigating the effectiveness of an intervention (Terry, 2012). This was applicable to the current situation where the new intervention of the newly developed innovation, using the Electronic Learning Management System (ELMS) approach, was initiated and its effect on educational performance was investigated. This project utilized a posttest-only randomized control group design in order to answer the project questions appropriately. This experimental design was used to measure the effect of a treatment on the desired population, with a treatment group and a comparison group using the traditional standard methods without any treatment. To judge the effect of the new treatment, measurements from the two groups were collected and compared after the implementation of an intervention.

The main aim of this study remains to evaluate the effectiveness of a new approach on learners' educational performance of the safe blood transfusion practices in using this new method. The new approach was used with the treatment group (experimental group) while the comparison group (control group) was educated using the traditional classroom approach used at the project site prior to this research. The

control group was not treated in any different way than that of the usual. The allocations of participants were made using their badge numbers and without having any contact with them other than the invitation email.

When using the posttest-only randomized control group design, also known as the *posttest-only design* or the *two-group posttest-only experimental design*, it is assumed that the two groups are equivalent where the only difference is that of the randomly assigned intervention (Health Services Research Methods [HSR], 2014). In this design, the data were collected only once and immediately after the participants completed the program (HSR, 2014). Comparisons, in such design, were made only after the intervention in order to measure the treatment effects, in keeping with National Registry of Evidence-based Programs and Practices (NREPP) guidelines (NREPP, 2014).

The major drawback of posttest-only design study is that it does not offer a baseline of the situation prior to the intervention to be compared with results collected post the intervention (NREPP, 2014). However, in order to measure the effectiveness of the new treatment on the two dependent variables in this study, it is not necessary to have a baseline for these variables to be compared with as it is assumed that the two groups are equivalent, and the only difference is that of the randomly assigned intervention (HSR, 2014).

In this project, the participants' responses to the intervention were investigated to determine whether the desired knowledge was achieved with the new approach or not. It was not the intention of the study to measure the degree of change in the level of education before and after the intervention, which makes the posttest-only design an appropriate design for such situation (NREPP, 2014). All the education courses in the targeted hospital were clinically relevant and linked to clinical competence that

needs to be achieved. Clinical competencies were not assessed prior to attaining the education, but rather after it. These competence skills were assessed for whether they were *met* or *not met* after completion of the related educational component. The posttest-only randomized control group design is classified as the simplest form of the true experiment. This posttest-only experimental design, and despite its simple structure, is easy to execute, relatively inexpensive and remain to be one of the best research designs for assessing cause-effect relationships (Trochim, 2006).

Population and Sampling

The target population for this research consisted of nurses working at a 1,200-bed tertiary hospital in Saudi Arabia. However, the study population included only those who are scheduled to attend the assigned clinical educational program via the traditional face-to-face method. The population chosen for this project consisted of registered nurses listed for attending the Safe Blood Transfusion Practice program over a period of one month (four sessions).

Being listed as attending the standard format program was the only inclusive criteria to be invited to take part in the study. The registration list contained approved registrations of registered nurses who are eligible and required to attend the program according to their nurse managers or direct supervisor. The population included nurses who have registered for safe blood transfusion practice program over a one-month period and the total number was initially estimated between 100 to 120 nurses, based on previous classes. Based on a probability of type I error (α), and a power of 80 with a difference between two means to be detected as 0.55 and an expected background standard deviation of 1, the sample size required for the 2 means comparison is 53 (per group).

Simple randomization was used to choose samples and allocations of participants to the treatment groups. Randomization produces treatment groups in which the distributions of prognostic factors, known and unknown, are similar. It helps to avoid possible bias in the selection and allocation of participants. It also provides a strong statistical basis for the quantitative evaluation of the evidence relating to treatment effects. In this project, simple randomization was implemented to choose the sample of registered nurses included in the study. Simple randomization using simple randomizer software (computerized random-number generator software) was also used to allocate participants equally into two groups A and B respectively. The first Group (Control Group) consisted of nurses randomly chosen to complete the clinical education program via the traditional or standard method (or no treatment). The second Group (Treatment / Experimental Group) included nurses who were asked to complete the course electronically using the new innovative approach (ELMS).

Simple randomization was used to remove bias from the allocation and distribution among the two groups. Every element in the population had the same probability of selection. Randomization was used with no constraints in order to generate an allocation sequence (unrestricted randomization; Higgins & Green, 2011). All nurses in the hospital that match the inclusion criteria were included in the simple randomization at the same time. Random allocation technique used the nurses' badge numbers allocated to each nurse. A random allocation sequence was generated using online computer-generated random numbers (Appendix A). For the Control group, nurses were asked to participate in the study by filling a posttest that was distributed after attending their scheduled program (standard face-to-face format). For the Experimental group, nurses were emailed an invitation to complete the electronic course (ELMS) by clicking an access link in the email.

Both, the standard, and the electronic format included identical program contents including the PowerPoint presentations, standard instructions, and the handouts. It also included identical education achievement posttest used for Control group. The Control group participants continued on their path of attending the face-to-face program; this was required by the current hospital regulations.

Data Collection

Data were collected after securing the Institutional Review Board (IRB) approvals from Walden University, Hospital Nursing Services and the hospital research scientific committee (King Abdullah International Research Center (KAIMRC; Appendix H). Data collection was established through two methods. For the treatment group, the instrument used for data collection will be included as a part of the ELMS course. Once the participants completed the educational material, they were directed to proceed to complete the posttest knowledge assessment. The instructions for data collection were summarized in the invitation email in addition to that included in the ELMS course. Clear instructions were again included in each section/page of the electronic course. As for the group A, the control group, the participant's program evaluation data were collected via the traditional way. Post-test knowledge assessment /demographic data materials were distributed using standard paper-based format.

In this posttest-only design, the data were collected once and immediately after the participants complete the program. Data collection from both groups continued over a period of one month, from 15 Nov. 2015 to 15 Dec. 2015 (Appendix F).

While the data from the intervention group was collected automatically from the electronic system, data gathered from the control group was collected through the

routine format. Participants were asked to put their completed anonymous Post-tests packages in a designated box in the assessment room. Collected data did not contain any inscriptions that might reveal the participant's identity.

In this project, the allocation of participants was made using last three digits of their badge numbers and without having any contact with them other than the invitation email. After distributing the email invitations, no contact with participants was made. Responses did not contain any all the participants' identities, which all remain as anonymous. Assurance was given to participants that "no personal information will be disclosed, and data will be collected as part of the study and will be only accessible to authorized entities". As to the comparison group (traditional approach), participants were asked to complete the posttest without adding any identification codes that may link their responses to their personal identities. Nevertheless, the papers were coded for statistical and grading reasons. The primary investigator was neither involved in distributing nor in collecting and grading of the paper-based tests which were made electronically post entering the data to the SPSS. On the other hand, the electronic version was distributed, collected and graded electronically through the ELMS.

Instrumentation and Treatment

The 20-item Posttest Knowledge Assessment (Appendix G) was the only instrument used in this project for data collection for both groups after the intervention. The Posttest Knowledge Assessment was designed to assess the educational achievement in order to judge whether the learning outcomes has been achieved or not. These outcomes were included in the content of the programs in both groups. The primary focus of the posttest assessment was on the essential components related to safe blood transfusion practices including hospital related policies and the

Joint Commission International (JCI) related patient safety goals that are adopted by the hospital.

The posttest knowledge assessment has used the predesigned multiple-choice safe blood transfusion exam that was previously developed by nursing education department. A demographic data section was added to this tool including the age, education level, and years of experience (Appendix E). An experienced hematology nurse specialist reviewed the test content in addition to the Blood Bank education coordinator who has responsibility, by hospital policy, to monitor practices concerning blood transfusion. The tool was reviewed for clarity, appearance, and format (electronic and manual) by educational experts. In addition to the Blood Bank education coordinator, four nurse educators volunteered to complete the posttest electronic version for the purpose of evaluation. The reviewers' recommendation was to proceed with the predesigned test and they all supported keeping the test without any change.

The treatment in this project was administered in the form of the new innovation (ELMS) to the Experimental group whereas the Control group remained taking the traditional standard treatment. The content of both, the new and the standard treatments continued to be the same except with the method and style of education delivery. I presented the same Powerpoint presentation and handouts to both groups. The presentation in the ELMS was in the form of self-automated video with audio instruction of the same script presented for the control group (Appendix D). The treatment group accessed the ELMS course through a link sent to their email accounts with access details included. Access details were set by the system as *anonymous*; participants were assured of this anonymity prior to attempting to

complete the posttest. Once submitted, the assessment tools were no longer accessible by the same participant as it was set for one attempt.

Protection of Human Subjects

The use of the current technology has limited ethical considerations as it did not involve patients and did not include any assessment of behaviors, attitudes, and emotions. The invitations for participating in the study were not initiated until the approvals of Walden University and that of the Hospital IRB were granted (Appendix H). The subjects' privacy and data confidentiality were maintained throughout the study. All measures were taken so that participants are not identified. Choosing the participants and assigning the participants to the treatment and comparison groups were made through randomization.

The participation invitations to share in the project contained a predesigned informed consent (Appendix I) form for completion prior to proceeding with the participation. Participant of the electronic version (Experimental group) were asked to reply to the sender's email with the consent signed prior to proceeding with their participation. Clear instructions were included in the consent form stating that proceeding to complete the assessment tool was voluntary and participants have the choice to withdraw at any time. The electronic invitations included clear information and instructions that explain the measures taken to ensure confidentiality and identification anonymity. In addition, there will be a clear explanation of how the data will be used and dealt with and participants were offered the opportunity for the participant to accept or reject sharing in the study. This includes accessing, storing and future disposal of data. Of these measures taken, is the use of nonpublic, password-protected computers to store data under processing. While all information

was included electronically to the experimental group, it was also made available to the control group prior to the distribution of the posttest.

Participants were not compensated for their time spent in the study which was from their regular paid hours as per agreement with the hospital administration. Nevertheless, a donut and a hot drink were offered to all program attendees regardless of their participation in the study. The nursing education center venue was used for all the sessions in coordination with the Center director.

Data Analysis

Analyzing data from this study was made by comparing the measurement from the control group with that of the experimental group. The main goal was to detect whether the two groups' responses were different after attending the program with the traditional and the new approach. The difference between the groups was investigated by analyzing the difference of measurement responses for each variable.

There were several ways that could be used to estimate the treatment effect on the groups' responses to the two-group posttest-only design. Of the ways to compare the treatment effect, is by testing the differences between the means using a *t*-test, or one-way Analysis of Variance (ANOVA), or through regression analysis. While the regression analysis approach is the most general, yet all the three yield mathematically equivalent results (Trochim, 2006). For this study, using the independent *t* test analysis was adopted.

I used the statistical analysis software Statistical Package for Social Sciences (SPSS) to analyze the study data. To determine whether the two groups were different, the mean scores and the difference between the means of each group and its distribution of the scores around the mean (variability) were calculated. The difference between the means distributions and spread of the scores around the means

for both the treatment and control group gives an indication whether the variability is low, medium or high. When the variability is low, it indicates that the means of the two groups are different. To determine the differences between the treatment and control groups' scores, the independent *t* test was used, which enabled me to detect whether the two groups responses were different after the program. I also computed the *p* values. All data from both groups were entered into the SPSS software where the analysis was generated accordingly for the *t* test and with a *p* value less than 0.05.

Project Evaluation Plan

Program evaluation is a sum of implementation, effectiveness, efficiency, cost effectiveness and attribution (Hodges & Videto, 2011). Program evaluation is an ongoing process that is intrinsic to a nursing program. An effective nursing program is measured by its success about established outcomes and quality determinations based on standards for the profession and education, in general. Program evaluation helps in maintaining quality, assessing curriculum and instruction, identifying areas of challenge, and facilitating program improvement (Gard, Flannigan, & Cluskey 2004). The primary purpose of program evaluation is to provide feedback on results, accomplishments or outcomes and to measure the effectiveness of programs (Kettner, Moroney, & Martin, 2013).

For this project, it was essential to have an ongoing plan for evaluation. A systematic plan for evaluation makes it easier to address the need for timely curricular or other program change, maintain consistency within the curriculum, and provide a mechanism to keep currency with trends in nursing and education (Gard et al., 2004). The Evaluation was based on the Rogers' theory of diffusion where the treatment group participants are considered as early adopters or the first to take the course (Matten et al., 2011).

Summary

Nurses remain to be the principal stakeholder in any healthcare setting. For developing a successful implementation plan, it is essential to understand their adoption tendencies (Holtz & Krein, 2011). Participants' collaboration and responses remain to be in the core of the project. While current developments in technology have proven to be an essential component of the care for patients in any clinical setting, it has an extraordinary potential for transforming clinical education to meet the growing need for customized, on-demand learning (Nafukho, 2007).

The Electronic Learning Management System (ELMS) could be a reliable alternative and perhaps more efficient than the traditional system for conducting clinical nursing education programs. Once adopted, it can make clinical learning and training more accessible, feasible, and satisfactory which all contribute to the safety and quality of patient care. It would support the preparedness of the increasing numbers of nursing staff due to hospital expansion, and will eventually be helping in easing the workload in the clinical area.This project focused on measuring the effectiveness of a new approach introduced to provide nurses with the essential knowledge for safe and adequate practice. It did not intend to measure the efficiency of the ELMS alone but in compared to the face-to-face standard method. The posttest-only experimental design choice was suitable to evaluate the impact of the new approach on knowledge achievement concerning the safe blood transfusion practices.

Section 4: Discussion and Implications

Summary of Findings

Findings from the collected data have revealed results related to the participant characteristics, posttest knowledge assessment scores and other findings of both the experimental and controlled groups. Data were collected over a one-month period from 15 November to 15 December 2015. From a total of 153 participants, invitations were distributed to 130 randomly chosen participants who were equally distributed (*n* = 65 each group) through simple randomization to two groups, the experimental and controlled group. Of the 65 participants of the experimental group, 57 (87.6%) responded on time by filling the posttest tool prior attending the face-to-face session. Late respondents from the experimental group were excluded. On the other hand, all the 65 participants of the controlled group completed the posttest knowledge assessment along with the attached demographic data. Statistical analysis of 122 responses of both, the experimental and controlled groups, was carried out with the Statistical Package for Social Sciences (SPSS).

The demographic data has shown that the majority of participants were females (*n* = 115, 94.3%), and only 5.7% (*n* = 7) were males as displayed in Table 1. Some 39.3% (*n* = 48) of participants were less than 30 years old, 41% (*n* = 50) between the age 30 and 40, 13.9% (*n* = 17) between the age 41 to 50, and 5.7% (*n* = 7) of participants were more than 50 years old. Some 90.2% of the participants were staff nurses (*n* = 110), 4.9% (*n* = 6) were Clinical Resource Nurses, and 2.5% (*n* = 3) were Nurse Managers. Only 2.5% (*n* = 3) of the participants were from medical areas, 32% (*n* =39) were from surgical areas, 17.2% (*n* = 20) of the participants were from Critical Care areas, 0.8% (*n* = 1) of the participants were from Oncology/Hematology areas, and 0.8% (*n* = 1) of the participants were from Emergency Care areas.

61.5% of the participants (*n* = 75) were with bachelor degree whereas 36.1% (*n* = 44) with diplomas and only 2.5% (*n* = 3) were with Post Graduate Degree. 43.4% (*n* = 53) of participants have been in the hospital for less than one year, whereas 27.9% (*n* = 34) from one to 5 years, 18% (*n* = 22) for more than 5 to 10 years (≤10) and 10.7% (*n* = 13) were in the hospital for more than 10 years (≤10). 22.1% (*n* = 27) of participants have been in the nursing profession from one to 5 years, whereas 38.5% (*n* = 47) for more than 5 to 10 years and 39.3% (*n* = 48) were in the hospital for more than 10 years (Table 1).

Table 1 *Demographic*

Data (n = 122*)*

Category	Response	*f*	%
Gender	Male	7	5.7
	Female	115	94.3
Age	Less than 30 yrs	48	39.3
	30 - 40 yrs	50	41.0
	41- 50 yrs	17	13.9
	More than 50 yrs	7	5.7
Occupation	Staff Nurse	110	90.2
	Clinical Resource Nurse	6	4.9
	Nurse Manager	3	2.5
	Other	3	2.5
Area	Medical	3	2.5
	Surgical	39	32.0
	Oncology/Hematology	1	.8
	Critical Care Area	21	17.2
	Operating Room	45	36.9
	Emergency (ECC)	1	.8
	Other	12	9.8
Level of Education	Diploma	44	36.1
	Bachelor Degree (BS)	75	61.5
	Post Graduate Degree	3	2.5
Years of Experience in Hospital	Less than 1 year	53	43.4
	1 to 5 years	34	27.9
	>5 to ≤10 years	22	18.0
	more than 10 years	13	10.7
Years of Experience in Nursing	1 to 5 years	27	22.1
	>5 to ≤10 years	47	38.5
	more than 10 years	48	39.3

When analyzing the demographic characteristics (age, gender, occupation, area, level of education, years of experience in hospital, and years of experience in nursing) distribution among the experimental and controlled groups, none of it had a significant difference between the two groups (Table 2).

Table 2

Distribution of Characteristics Across the Experimental and Control Groups

		Experimental		Controlled				
		Count	%	Count	%	Chi-square	*df*	Sig.
Age						.332	3	.954
	Less than 30 yrs.	22	45.8%	26	54.2%			
	30-40 yrs.	23	46.0%	27	54.0%			
	41-50 yrs.	8	47.1%	9	52.9%			
	More than 50 yrs.	4	57.1%	3	42.9%			
Gender						.045	1	.833
	Male	3	42.9%	4	57.1%			
	Female	54	47.0%	61	53.0%			
Occupation						1.056	3	.788
	Staff Nurse	50	45.5%	60	54.5%			
	Clinical Resource Nurse	3	50.0%	3	50.0%			
	Clinical Nurse Coordinator	0	.0%	0	.0%			
	Nurse Manager	2	66.7%	1	33.3%			
	Other	2	66.7%	1	33.3%			
Area						3.318	6	.768
	Medical	1	33.3%	2	66.7%			
	Surgical	20	51.3%	19	48.7%			
	Oncology/Hematology	1	100.0%	0	.0%			
	Critical Care Area	10	47.6%	11	52.4%			
	Operating Room	19	42.2%	26	57.8%			
	Emergency (ECC)	1	100.0%	0	.0%			
	Out Patient (ACC)	0	.0%	0	.0%			
	Other	5	41.7%	7	58.3%			
Level of Education						.750	2	.687
	Diploma	19	43.2%	25	56.8%			
	Bachelor Degree (BS)	36	48.0%	39	52.0%			
	Post Graduate Degree	2	66.7%	1	33.3%			
Years of Experience in Hospital						.679	3	.878
	Less than 1 year	24	45.3%	29	54.7%			
	1 to 5 years	15	44.1%	19	55.9%			
	>5 and ≤10 years	12	54.5%	10	45.5%			
	more than 10 years	6	46.2%	7	53.8%			
Years of Experience in Nursing						1.823	2	.402
	Less than 1 year	0	.0%	0	.0%			
	1 to 5 years	10	37.0%	17	63.0%			
	>5 and ≤10 years	25	53.2%	22	46.8%			
	more than 10 years	22	45.8%	26	54.2%			

Participants from both groups completed the identical twenty multiple-choice question Safe Blood Transfusion Practices posttest knowledge assessment with the highest score 100. The participants' mean scores ranged from 50 to 100/100. The overall mean score in the posttest knowledge assessment was 82.7/100 (*SD* = 11.79; see Table 3). About 80% (*n* = 97) of participants scored more than or equal (≥) to 75/100 whereas 66.4% (*n* = 81) scored ≥ 80/100 (Table 4).

Table 3 *Descriptive Statistics*

				M		
	Number	Minimum	Maximum	Statistic	*SE*	*SD*
Grade	122	50	100	82.70	1.067	11.786

Table 4

Overall Grade Distribution

Grade	Frequency	Valid %	Cumulative %
100	15	12.3	12.3
80	13	10.7	66.4
75	16	13.1	79.5
50	1	.8	100.0
Total	122	100.0	

Participants' posttest knowledge assessment scores from the controlled group ranged from 50/100 to 95/100. Some 66.2% (*n*=53) of participants scored more than or equal to 75/100 whereas 50.8% (*n*=43) scored more than or equal to 80/100 (Table 5). As to the experimental group, the scores ranged from 70/100 to 100/100 (Table 6). Some 94.7% (*n*=54) of participants scored more than or equal to 75/100 whereas 84.2% (*n*=48) scored more than or equal to 80/100 (Table 5).

Table 5

Grade Distribution by Group

Grade	Group											
	Controlled				Experimental				Total			
	Valid		Cumulative		Valid		Cumulative		Valid		Cumulative	
	f	%	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
100	0	0	5	0	15	26.3	15	26.3	15	12.3	15	12.3
95	5	7.7	8	7.7	9	15.8	24	42.1	14	11.5	29	23.8
90	3	4.6	23	12.3	11	19.3	35	61.4	14	11.5	43	35.2
85	15	23.1	33	35.4	10	17.5	45	78.9	25	20.5	68	55.7
80	10	15.4	43	50.8	3	5.3	48	84.2	13	10.7	81	66.4
75	10	15.4	53	66.2	6	10.5	54	94.7	16	13.1	97	79.5
70	10	15.4	57	81.5	3	5.3	57	100	13	10.7	110	90.2
65	4	6.2	63	87.7	0	0	57	100	4	3.3	114	93.4
60	6	9.2	64	96.9	0	0	57	100	6	4.9	120	98.4
55	1	1.5	65	98.5	0	0	57	100	1	0.8	121	99.2
50	1	1.5	5	100	0	0	57	100	1	0.8	122	100
Total	65	100			57	100			122	100	15	

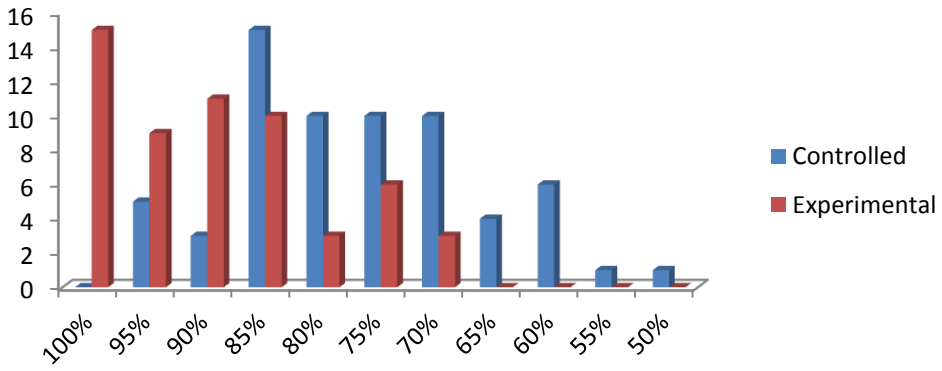

Figure 2. A bar chart showing the grade distribution between the control and experimental groups.

I conducted an independent-sample *t* test using SPSS, comparing the experimental and controlled posttest knowledge scores. The level of significance was set at 0.05. The mean score for the controlled group was 76.85/100 (*SD* = 10.628). The mean score for the experimental group was 89.39/100 (*SD* = 9.26; Table 6).

Table 6

Group

Statistics

Group	*M*	*SD*	*SEM*	Maximum	Minimum
Controlled	76.85	10.628	1.318	95	50
Experimental	89.39	9.262	1.227	100	70

The findings showed a statistically significant difference of knowledge attained by the participant using the new innovative method of ELMS and that attained by participants who attended the traditional face-to-face method (p <0.00; Table 7).

Table 7

t Test for Equality of Means. Independent Samples Test.

						95% Confidence Interval of the Difference	
Assumption	*t*	*df*	Sig. (2-tailed)	Mean Difference	*SE* Difference	Lower	Upper
Equal variances assumed	6.901	120	.000	12.540	1.817	8.942	16.137
Equal variances not assumed	6.964	119.997	.000	12.540	1.801	8.975	16.105

Discussion of Findings

The demographic data have shown that the majority of the participants were female staff nurses (90.2%) less than 40 years old (80.3%) with a bachelor degree

(61.5%). At the time of the study, none of the participants had been in the nursing profession for less than one year, due to the hospital's hiring criteria of a minimum of two years' experience. While a significant majority of the nurse participants were females, the male participants were not excluded from the study and were represented in both groups. There was no significant difference between all the demographic data of the two groups perhaps due to the randomization used in choosing the participants and their allocations.

Results from this study showed a clear statistical significance between the knowledge achievements of two groups of this project. Nurses using the new innovative method have clearly scored higher than those who attended the program through the face-to-face traditional learning method and the mean average difference was significant (Figure 3). These findings align with prior studies on the positive impact of e-learning systems on student learning (Alkhalaf, Drew, & Alhussain, 2012) and positive students' academic attitudes in Saudi Arabia (Alkhalaf, Drew, AlGhamdi, & Alfarraj, 2012). Similarly, these results also go with earlier findings of Larsen and Vincent-Lancrin (2005) concerning the enhancement of the overall learning and teaching experience through e-learning and that of Shachar and Neumann (2003) where the majority of students taking courses by distance education outperformed those enrolled in traditionally instructed courses.

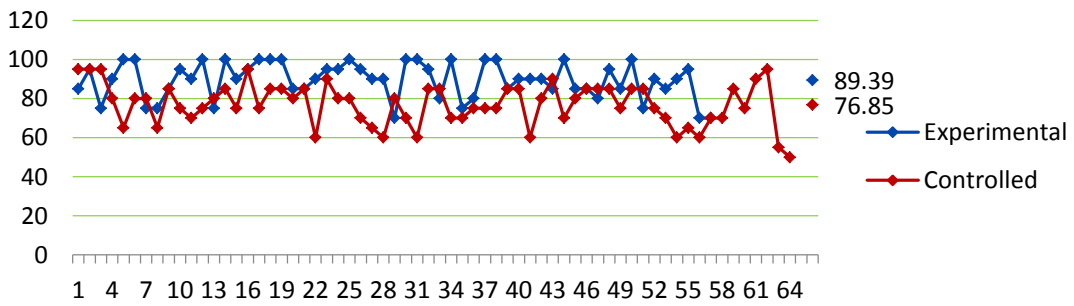

Figure 3. A graph of the grade distribution among groups.

Nevertheless, while the ELMS that was used in this study has many commonalities to that used in most studies, yet it is different in several aspects. The ELMS that was used in this study was designed to be accessed through hospital intranet using employees' username/password. It is accessible from any PC in the hospital and access links could be accessed from hospital main page and could be shared easily through emails. However, the uniqueness of this study results remains that the participants were experienced nurses working in the hospital and not undergraduate students.

While the study was investigating the impact of the new innovation on the educational achievement, yet the influence on accessibility was very clear. Nurses were able to access the module through the link sent to their emails. They were free to access it at their own chosen time and from their desired location. Participants had the chance to read the materials, watch the presentation and do the e-Test without many of the constrictions that the traditional method has. They were also able to view their results immediately and were able to print it for their records. Results from this study have shown that not only ELMS could be an alternative to the face-to-face courses, but also a more efficient one in terms of access, flexibility and knowledge achievement.

Implications

Implications for Practice/Action

It is clear from the discussion above that the new ELMS had a positive impact on knowledge achievement of staff nurses. Nurses in the experimental group were able to access the course using their regular hospital usernames and passwords, read

the materials and watch the audio-visual presentation at the time and place they have chosen. Participants were able to view their results immediately after completing the assessment and had the chance to print and save their results in their accounts. The electronic system was accessible by large numbers at the same time. The posttest knowledge assessment test was opened in a secure window and had a countdown stopwatch on its upper left side. The e-Test system had the ability to shuffle the questions and the multiple-choice answers and could choose the questions randomly from a test bank. However, the later setting was not used in the study in order to ensure equal that the electronic questions were identical to that of paper-based standard tests which the controlled group has completed.

To attend the face-to-face session, participants needed to arrange permissions from their area managers/ supervisors, arrange time off from their duty schedule/roster, register in advance for the course and wait for approval from the nursing education. Participants had to attend the face-to-face education location on time, complete manual attendance details/signatures and comply with the scheduled course timetable. The course was completed by the participant from different areas and working in separate hospital buildings. Participants who completed the paper-based standard tests (controlled group), in contrary to the experimental group, were not able to view their results on the day of the course and needed to wait until results were sent via message to their email addresses. Participants were also asked to come later in person to the nursing education center to collect their signed certificates as a proof of course completion.

Implementing the ELMS would definitely save nurse time and effort in accessing education. It has proven to be more practical in the current hospital than the traditional face-to-face method. ELMS have a positive impact on learners, educators

as well as on management and administration. The learners have a better opportunity in accessing and completing the desired education of their choice at the time and place of their choice. Nurses will eventually minimize time spent away from patient care area that is usually spent on the logistics for education. The educator has the opportunity to reach the 4,000+ nurses in an efficient manner. The managers, who have the proper access privilege, would have a chance to monitor their staff educational performance and achievement at any time and can access related data from any computer in the hospital. Saving time, money, and hours away from patient care areas would also have a positive impact on the administrative and decision makers in the organization.

This project has recently been put on the path of real application. An announcement was made of the Go-Live of the Nursing Electronic Learning System (ELS) and was published on the organization front page for 10 days. An access icon was added to the site e-services (Appendix J). As a phase one of the project, 14 self-study modules (SSM) that were based in the library (paper-based) were transformed into electronic learning modules (ELM). Approximately one thousand nurses have accessed the system in a period of one month. The next phase will be the going live with the courses that will be replacing the traditional face-to-face classes.

Implications for Future Research

This project has numerous implications for future research. This study focused on the impact of ELMS on nurses currently practicing rather than students. Further research on nurses and other healthcare workers in the hospital would give more insight of the impact of such innovation. Once this project is adopted in the current hospital, the door will be wide opened for further investigation and analyses of the detailed data generated from the system. Although the results have shown a clear

improvement of knowledge gained using the innovative method, yet further research should be continued for additional investigation of the impact of the electronic learning on other programs. Furthermore, the results of this project would encourage other researchers to replicate it and investigate other variables like the time spent on the educational materials and posttest assessment. Other researches could be useful to investigate the nurses' satisfaction, the influence of age, computer literacy, and educational methods adopted. Future research is needed to further investigate the type and quality of the electronic materials and its influence on satisfaction, educational achievement, and clinical performance.

Implications for Social Change

Findings of this study would encourage the hospital to adopt the ELMS. Integrating electronic learning to replace some of the face-to-face classes or that of the traditional paper-based study modules could play a significant role in tackling many obstacles the nurse educators are facing. The shortage of teaching faculty, the distances between the hospital and its training area, the shortage of nurses at the bedside, and the number of nurses in the Hospital (more than 4,000 nurses), are all factors that enable the new approach capable of making a clear positive social change within the hospital. The fact that e-learning ability to provide knowledge and education to a large number of learners from different areas within the medical city over a short time makes such method a practical method of education within such setting.

Adoption of ELMS could replace many of the traditional face-to-face, or paper-based education programs, it can be more learner-centered, self-paced, and problem-solving based (Ayub & Iqbal, 2011). The application of such technology will create a positive social change in the targeted hospital and is expected to revolutionize

the communication between the nurses in the clinical areas at the bedside and the nursing education department. Seeking approvals for the study, distribution of the tool and collection of the data alone had already attracted the attention of the decision makers in the nursing services who had shown a great support for the project which is believed to be one of the first implications in the direction of a positive social change. Adding such inspiration to that of the achieved positive findings, made the adoption of this innovation so realistic than ever. This has recently been demonstrated by initiating the Go-Live of phase 1 of the nursing e-learning system to transform the paper-based education programs to electronic ones.

Project Strengths and Limitations

Strengths

The current project has many strengths that add to the value of its findings. The study has adopted a controlled experimental design. The study used randomization to choose the participants and to allocate them into the two groups. Moreover, there was a clear inclusive criteria that helped in having a more homogeneous group and minimized the differences between the two groups. The results have shown no significant difference between the characteristics of the participants allocated to the experimental and controlled designs. Moreover, the study has achieved the desired sample size and exceeded the expectations of the estimated participation in the project.

This project remains unique to the environment and setting it had been conducted in. It has adopted technologies that are present in the organization and would be very practical to be adopted by the nursing education. This adds to the reality and applicability of the project to the current setting. In addition, the current project was the first of its kind to be conducted in the hospital focusing on the

educational technologies impact. The recent adoption of the project (phase 1) by the hospital remain to be one of its most important factors that would add to its strength.

Limitations

This project had several limitations. Although an experimental method was used, no pretest was conducted. Data were not collected prior to the intervention for several reasons, which may add some weekends to the design. And while randomization was used in the selection of the sample in addition to clear inclusive criteria for participants to be included in the study, yet it would have added more if the baseline level of knowledge for both, the experimental and controlled group, was tested prior to the intervention.

One of the weaknesses this project have is the fact that the knowledge gained from the face-to-face education will always remain to depend on several variables that could be hard to measure. For instance, the qualification of the educator, the educational skills, the teaching methods adopted, the level of experience, the setting of the classroom, the classroom environment, the quality of the audio-visual, and other variables will always remain factors that might affect the knowledge gained by the participants.

While the study materials including the videos were the same, controlling the variables to reach the standard method would be almost impossible due to the human nature involved. Replicating the study with other educators would add more to the reliability of the results achieved. On the other hand, advancement in technologies may also affect the knowledge gained by participants. Of these technical issues could be the appearance and design of the pages, the fonts, the colors being uses, the complexity of instructions, the quality of the audiovisuals, the network connectivity,

and many other factors that would affect the participants' attention and perhaps their knowledge gaining.

Recommendations for Remediation of Limitations

Replicating the study using a pre-/posttest randomized controlled design would add more to the reliability of the results. Additional studies might be needed to be conducted to determine the extent to which such findings are applicable to other programs and other participants. Moreover, it might be useful to replicate the study with other face-to-face educators and perhaps collecting the posttest data from the controlled groups from several classes of different educators. Adding more technological advancement to the electronic method might also affect the participants' cooperation and level of knowledge gained. Enhancing the audiovisual quality, the appearance and the format of the pages and instructions might also support the knowledge achieved by the experimental group. It is also recommended to measure the level of satisfaction along with the knowledge achievement measurement as it might support the understanding of the findings.

Analysis of Self

Analysis of Self as Scholar

While the main emphasis of the practice-focused doctoral programs (ie, DNP programs) is to prepare clinical experts in advanced nursing practice (Vincent, Johnson, Velasquez & Rigney, 2010), yet it too enables them to become real scholars. In addition to the completion of a scholarly project as a main component their doctoral education, DNP-prepared nurses, as practitioner-researchers, are committed to proficiency in the understanding and evaluation of scientific methods, critiquing research studies and involvement in scholarly products in order to effectively

contribute to the clinical applications of research theories and scientific discoveries. Developing literature reviews, critiquing research studies, developing research project through action research, and producing abstracts and presentations for nursing conferences are evidence of the preparations of the investigator of becoming a DNP-prepared scholar.

Analysis of Self as Practitioner

As a DNP-prepared nurse, closing the growing gap exists between research and practice remains to be the main tool to improve the quality of care in the clinical setting. Transformation of any healthcare system requires well-trained clinicians who understand the context of healthcare delivery and engage in finding the ways and tools to translate research and apply theories into the clinical practice. A positive social change within the health care system can only take place with the dedication and preparedness of practitioners that have the willingness and ability to create such change. As a health care practitioner, inter-professional collaboration with experts in research methods, experts in clinical practice and other stakeholders became a routine path for contributing to the improvement of care and patient outcomes and transformation of healthcare delivery system. The planned practicum experiences helped in developing and demonstrating advanced levels of clinical judgment, systems thinking, and accountability in designing, delivering and evaluating evidence-based care to improve patient outcomes. DNP preparation included proficiencies in the clear understanding of the context role in the application of research findings to the clinical setting.

Improvement in the quality of care and implementation of change require a clear understanding of the health care policies and that of the decision-making processes that include the engagement with stakeholders. It became clear to the

investigator that it's not only the quality of the new innovation but rather the approach, and persuasion ability of the practitioner to get a buy-in from the stakeholders and decision makers, and before all that, it is the clear vision and good planning that makes the project feasible and ready for implementation. Eventually, the DNP-prepared nurse is transformed into qualified practitioner with expertise in the application of scientific research methods into clinical practice which directly contribute to the reduction the research-practice gap.

Analysis of Self as Project Developer

DNP program equips nurses with the tools and methods that support them to evaluate and apply research findings and becoming engage in evidence-based practices and projects that actually prepare them to become active practitioner researchers in their clinical areas. The DNP project required proficiencies in literature review, research methodologies, and others in the conduction and evaluation of research projects. The DNP preparation helped the investigator, not only for developing a research study but more of research project that is feasible and suitable for application in real life practice. The investigator has chosen the project from a clear clinical need and for the purpose of applying the findings to respond to such need. Walking side-by-side with the supervisor throughout the project, and with the support and services of the university, the investigator became proficient with the development and conduction of research projects. Choosing randomized two-group control experimental design was a challenge to the investigator, yet it enhances his knowledge and experience in adopting such design for future projects. The DNP journey has played a crucial role in assisting the investigator to become a proficient project developer.

Summary and Conclusions

Development in educational technology has all the potentials to play a major role in the enhancements in the health care delivery. Electronic learning has shown more efficiency in terms of time and distance/location than the traditional methods. It has proven its capability to support delivering education and sharing of knowledge to a broad audience over widespread areas.

Studies in the field of e-Learning system and its impact in Saudi Arabian organizations still lack for more contribution (Alkhalaf, Drew, & Alhussain, 2012). The results of this study have revealed a significant difference between the experimental and control group. Findings of this project showed that the new innovative method using ELMS to be a more effective and efficient alternative to the face-to-face courses one in terms of access, flexibility and knowledge attainment that have which would encourage the targeted hospital to adopt it. Integrating Electronic Learning Management System in the targeted hospital could play a significant role in resolving many obstacles that nurse educators are facing, most of which related to a large number of nurses spread over a wider area in the medical city. Its first implication was by adopting the Nursing Electronic Learning System by the organization and placing its link on its home page site. The adoption started with phase one by replacing the traditional paper-based education programs into electronic ones and phase two would be replacing other face-to-face traditional courses. The application of such technology will definitely create a positive social change on the targeted health care setting and is expected to revolutionize the health care education methods and the communication between the nurse educators and nurses in the clinical practice.

Further research on the impact of the electronic learning nurses on other programs and with other health care workers would provide more insight of the impact of such innovation. Although the results have shown a clear improvement of knowledge gained using the innovative method, yet further research should be continued for. Furthermore, the results of this project would encourage other researchers to replicate it and investigate other variables like the time spent on the educational materials and posttest assessment. Other researches could be useful to investigate the nurses' satisfaction using such innovations and the influence of age, computer literacy and educational methods adopted. Future research is needed to further investigate the type and quality of the electronic materials and its influence on satisfaction, educational achievement, and clinical performance.

Section 5: Scholarly Product

This study was presented in an oral presentation at the Second International Conference in Nursing and Health Science that was held on the 28-30 March 2016 at the King Saud Bin Abdulaziz University for Health Sciences (Appendix K). The presentation was scheduled for the first day on the main conference platform. It was presented to an audience of more than one thousand healthcare workers, including national and international nursing experts and scholars as Prof. Roger Watson, Prof. Afaf Meleis, Dr. Jayne Smitten, and others.

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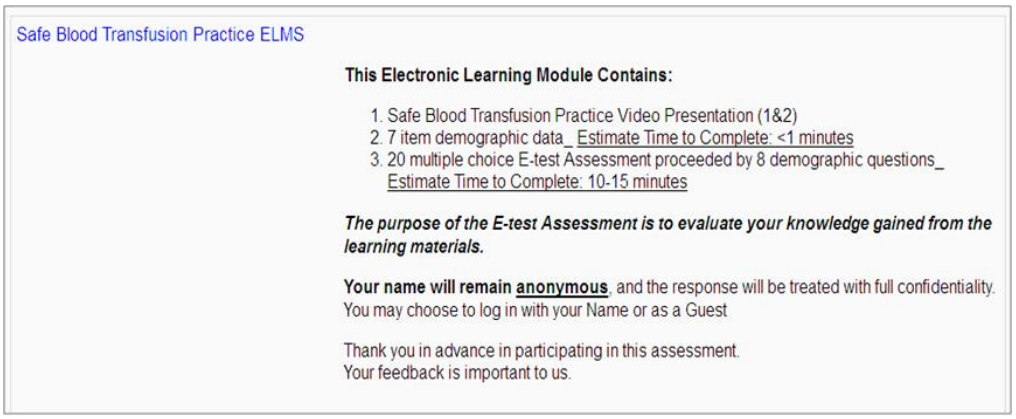
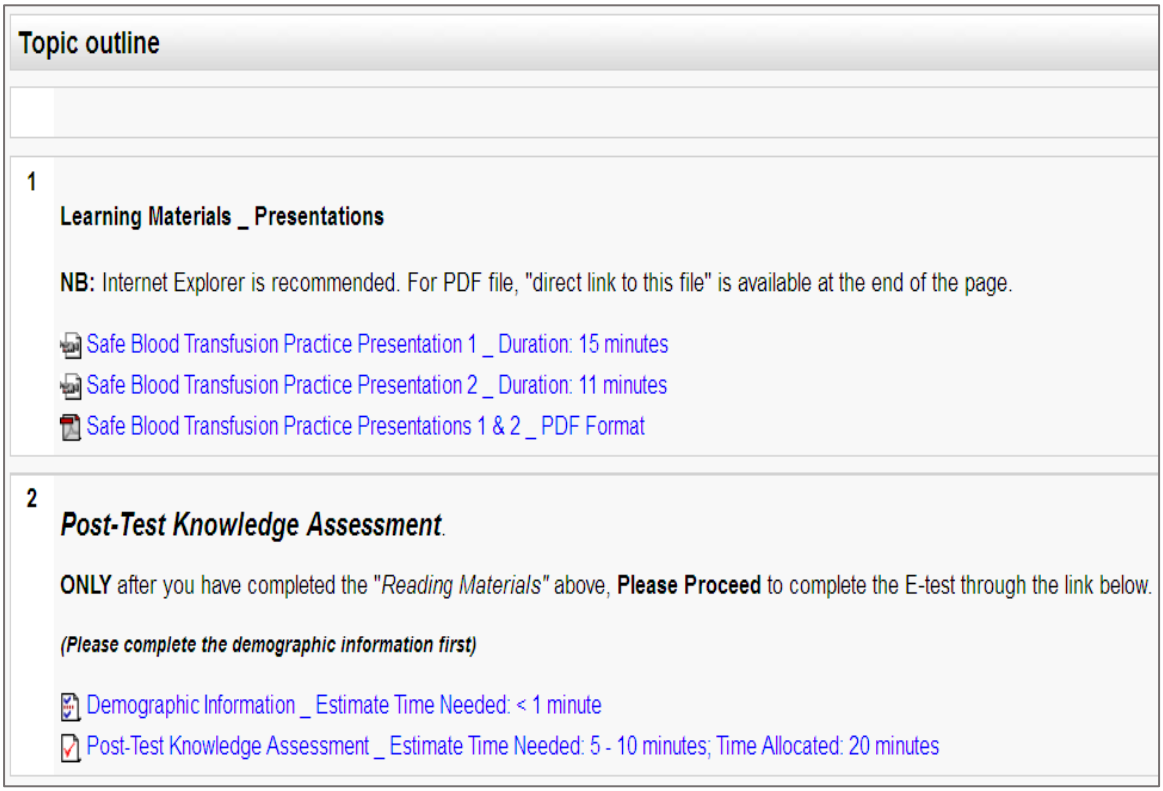
Appendix A: A Simple Randomizer Tool (Online)


domness an... (IE)
https://www.random.org/lists/
Search
RANDOM.ORG
Search RANDOM.ORG
Google™ Custom Search
Search
True Random Number Service
Do you own an iOS or Android device? Check out our app!
List Randomizer
There were 28 items in your list. Here they are in random order:
1. 71523
2. 47307
3. 61332
4. 71897
5. 70131
6. 61987
7. 64858
8. 64561
9. 49343
10. 61311
11. 71829
12. 71827
13. 70147
14. 70090
15. 71830
16. 72317
17. 56426
18. 52622
19. 64357
20. 62456
21. 72309
22. 56125
23. 52676
24. 72231
25. 70241
26. 72239
27. 52677
28. 45633
Timestamp: 2015-11-18 13:46:31 UTC, IP: 84.235.83.65
Again!
Go Back
Follow @RandomOrg
G+1
17k
© 1998-2015 RANDOM.ORG
Valid XHTML 1.0 Transitional | Valid CSS
Terms and Conditions

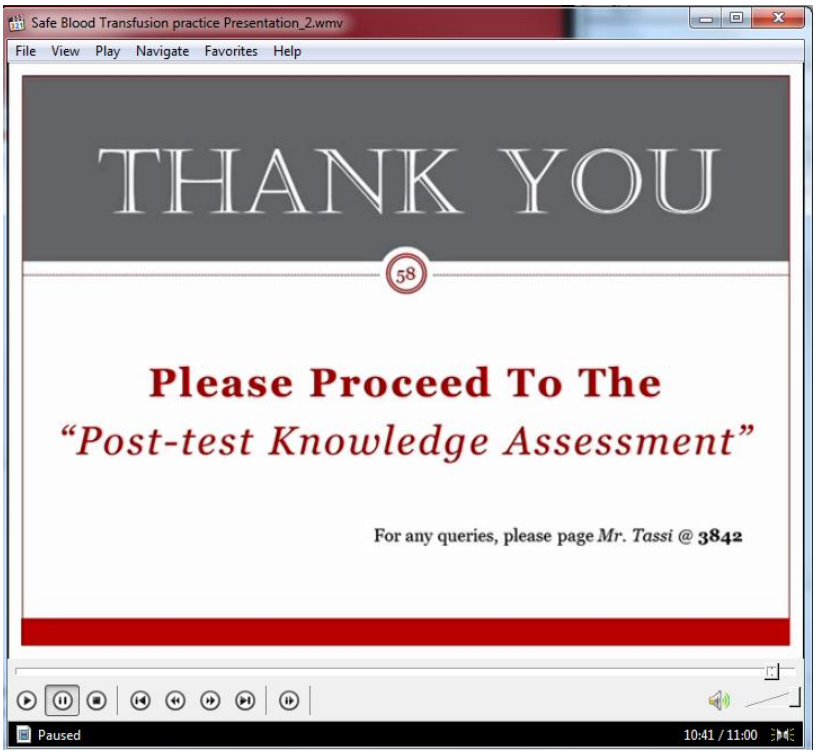
Appendix B: ELMS Front Page

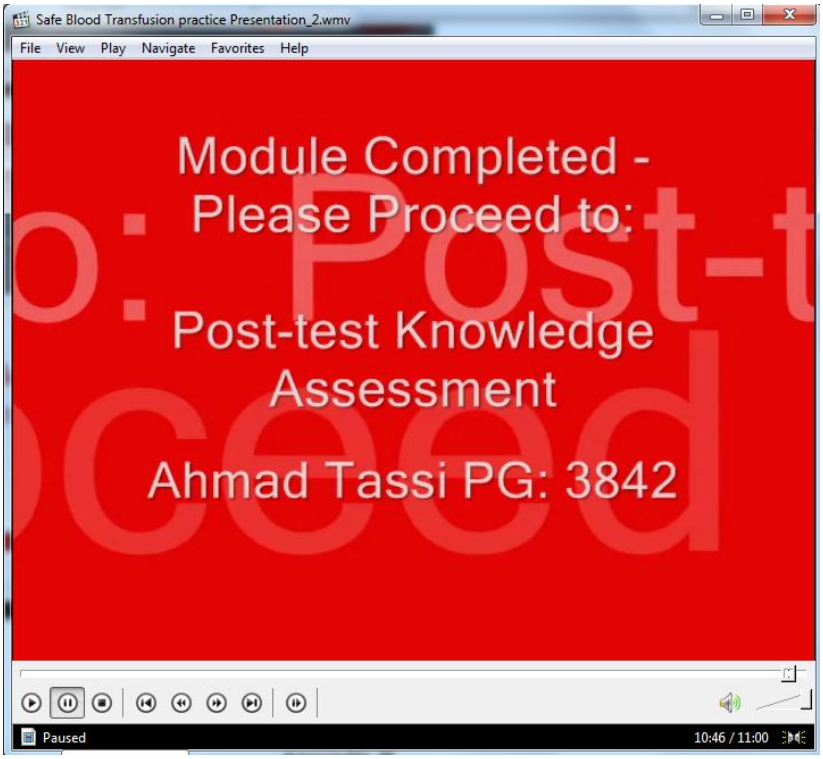


Appendix C: ELMS Topic Outline



Appendix D: Safe Blood Transfusion Course Video Presentation


Safe Blood Transfusion practice Presentation_2.wmv
File View Play Navigate Favorites Help
THANK YOU
58
Please Proceed To The
"Post-test Knowledge Assessment"
For any queries, please page Mr. Tassi @ 3842
Paused
10:41 / 11:00

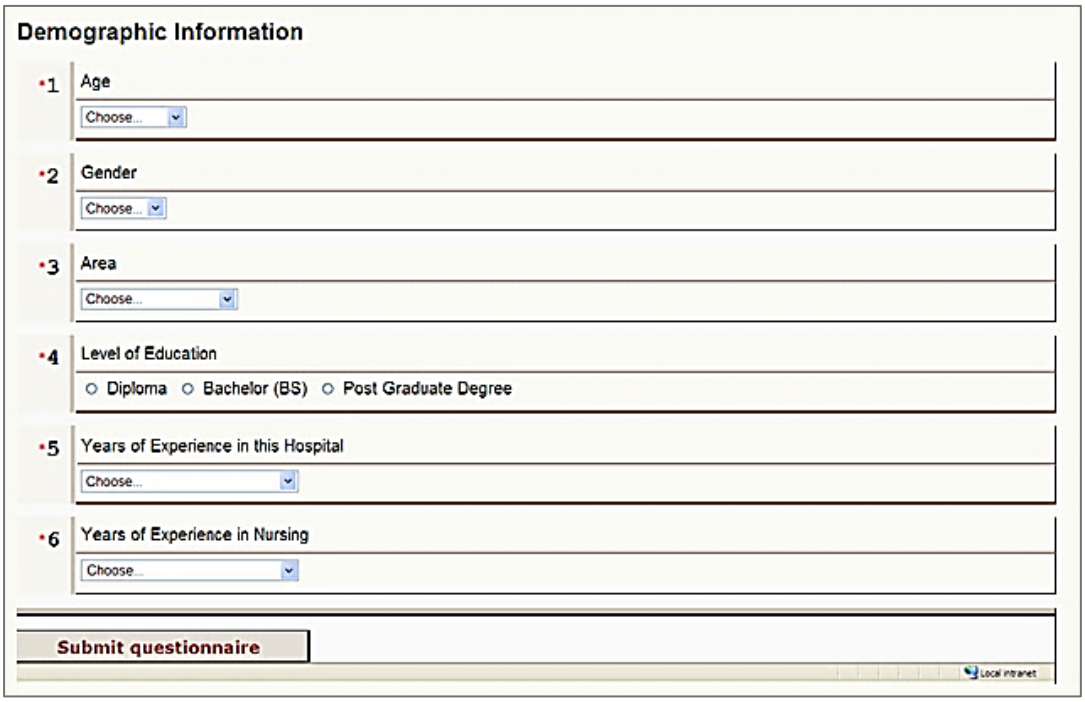

Safe Blood Transfusion practice Presentation_2.wmv
File View Play Navigate Favorites Help
Module Completed -
Please Proceed to:
Post-test Knowledge
Assessment
Ahmad Tassi PG: 3842
Paused
10:46 / 11:00

Appendix E: Demographic Information

Demographic Information –Paper-based

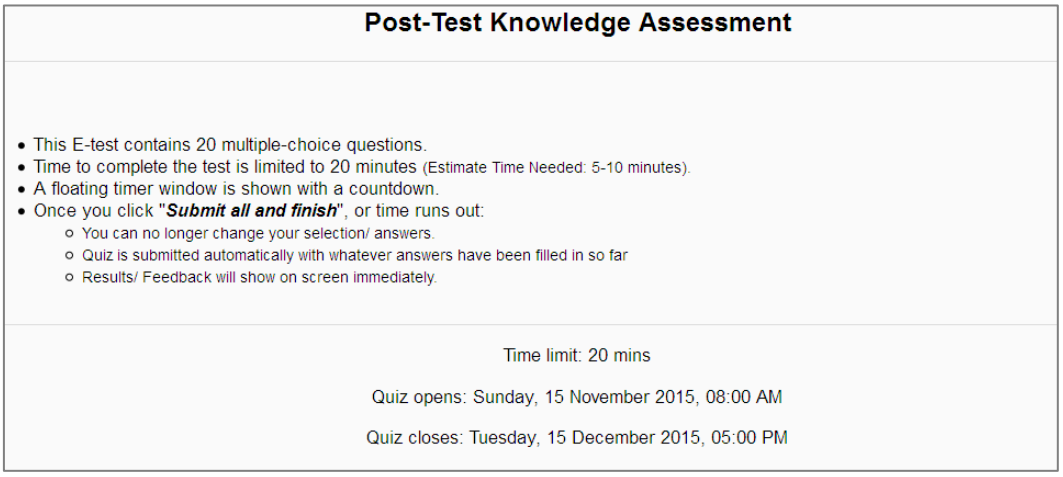
1-	**Age** ☐Less than 30 ☐31 to 40 ☐41 to 50 ☐More than 50
2-	**Gender** ☐Male ☐ Female
3-	**Occupation** ☐Staff Nurse ☐Clinical Resource Nurse ☐Clinical Nurse Coordinator ☐Nurse Manager ☐Other
4-	**Area** ☐Medical ☐Surgical ☐Oncology/ Hematology ☐Critical Care Area ☐Operating room ☐Emergency (ECC) ☐Out Patient (ACC) ☐Other
5-	**Level of Education** ☐Diploma ☐Bachelor (BS) ☐Post Graduate Degree
6-	**Years of Experience in this Hospital** ☐Less than 1 year ☐1-5 years ☐>5 (more than 5) and <10 (less than 10) ☐More than 10 years
7-	**Years of Experience in Nursing** ☐Less than 1 year ☐1-5 years ☐>5 (more than 5) and <10 (less than 10) ☐More than 10 years

Demographic Information – *e-version (ELMS)*



Appendix F: Posttest Knowledge Assessment – e-version (ELMS)

Posttest Knowledge Assessment front page



Post-Test Knowledge Assessment

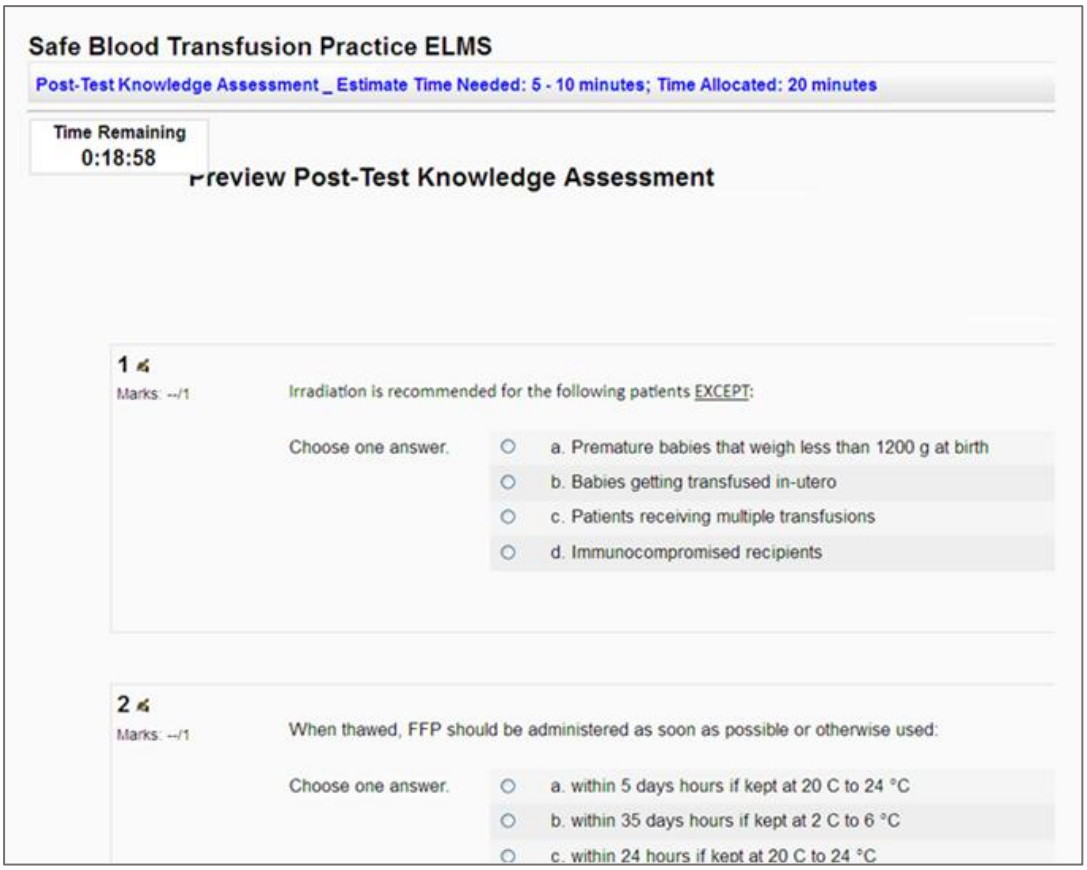
- This E-test contains 20 multiple-choice questions.
- Time to complete the test is limited to 20 minutes (Estimate Time Needed: 5-10 minutes).
- A floating timer window is shown with a countdown.
- Once you click "***Submit all and finish***", or time runs out:
  - You can no longer change your selection/ answers.
  - Quiz is submitted automatically with whatever answers have been filled in so far
  - Results/ Feedback will show on screen immediately.

Time limit: 20 mins

Quiz opens: Sunday, 15 November 2015, 08:00 AM

Quiz closes: Tuesday, 15 December 2015, 05:00 PM

Post Test Knowledge Assessment Sample



Safe Blood Transfusion Practice ELMS

Post-Test Knowledge Assessment _ Estimate Time Needed: 5 - 10 minutes; Time Allocated: 20 minutes

Time Remaining
0:18:58

Preview Post-Test Knowledge Assessment

1
Marks: --/1

Irradiation is recommended for the following patients EXCEPT:

Choose one answer.

- a. Premature babies that weigh less than 1200 g at birth
- b. Babies getting transfused in-utero
- c. Patients receiving multiple transfusions
- d. Immunocompromised recipients

2
Marks: --/1

When thawed, FFP should be administered as soon as possible or otherwise used:

Choose one answer.

- a. within 5 days hours if kept at 20 C to 24 °C
- b. within 35 days hours if kept at 2 C to 6 °C
- c. within 24 hours if kept at 20 C to 24 °C

Appendix G: Posttest Knowledge Assessment – Paper-Based (ELMS)

Post-Test Knowledge Assessment: Safe Blood Transfusion Practice

Please choose the most appropriate answer.

1. The universal recipient blood group of PRBC is:
   a. O
   b. A
   c. B
   d. AB
2. Which blood group is the universal donor for PRBC?
   a. A
   b. B
   c. AB
   d. O
3. Which blood group is the universal donor for plasma?
   a. A
   b. B
   c. AB
   d. O
4. When thawed, FFP should be administered as soon as possible or otherwise used:
   a. within 24 hours if kept at 20 C to 24 °C
   b. within 24 hours if kept at 2 C to 6 °C
   c. within 5 days hours if kept at 20 C to 24 °C
   d. within 35 days hours if kept at 2 C to 6 °C
5. Which of the following does not require a physician's order?
   a. Leukodepletion
   b. Irradiation
   c. Blood Warmer
   d. None of the above

Post-Test Knowledge Assessment: Safe Blood Transfusion Practice

6. Transfusing blood component must start, or otherwise returned to TMS within:
   a. 15 minutes.
   b. 30 minutes.
   c. 1 hour.
   d. 4 hours.

7. When stored appropriately, the Packed Red Blood Cells (PRBC) shelf life is:
   a. 5 days
   b. 35-42 days
   c. 120 days
   d. None of the above

8. Your patient is for PRBC and platelets transfusion, which of the following is more accurate:
   a. Always transfuse platelets FIRST
   b. Always transfuse PRBC FIRST
   c. Start with either PRBC or platelets
   d. Start both but in different IV lines

9. Irradiation is recommended for the following patients EXCEPT:
   a. Babies getting transfused in-utero
   b. Premature babies that weigh less than 1200 g at birth
   c. Immunocompromised recipients
   d. Patients receiving multiple transfusions

10. A nurse should ensure that red blood cells transfusion does not run beyond _____ post collection from designated blood storage:
    a. 2 hours
    b. 3 hours
    c. 4 hours
    d. 6 hours

Post-Test Knowledge Assessment: Safe Blood Transfusion Practice

16. A transfusion reaction is most likely to occur within _____ minutes of the start of the transfusion
    a. 3 minutes
    b. 15 minutes
    c. 30 minutes
    d. 60 minutes

17. The first nursing intervention to be done if a transfusion reaction is suspected is:
    a. Call the physician
    b. Take vital signs
    c. Stop the transfusion
    d. Hold the patients hand

18. The solution of choice to use with blood products is:
    a. Normal Saline
    b. Lactated Ringers Solution
    c. 1/2 Normal Saline Solution
    d. D5W

19. To prevent bacterial contamination of the blood product and possible sepsis, you will:
    a. Run the blood product through an infusion pump.
    b. Assure the peripheral IV catheter is a 22 gauge or larger.
    c. Co-assess the key elements with another licensed colleague prior to hanging the product.
    d. Change the blood administration set and filter every 4 hours or after every 2 units of PRBCs.

20. A consent for blood transfusion is valid for:
    a. 24 hours
    b. 30 days
    c. 90 days
    d. 120 days

Post-Test Knowledge Assessment: Safe Blood Transfusion Practice

11. Which of the following is NOT True about Emergency PRBC Release - Class I
    a. It is used in life threatening situations
    b. It is an Un-Crossmatched PRBC
    c. It is delivered to the patient's bedside in 5 minutes or less
    d. It is a grouped and typed compatible PRBC

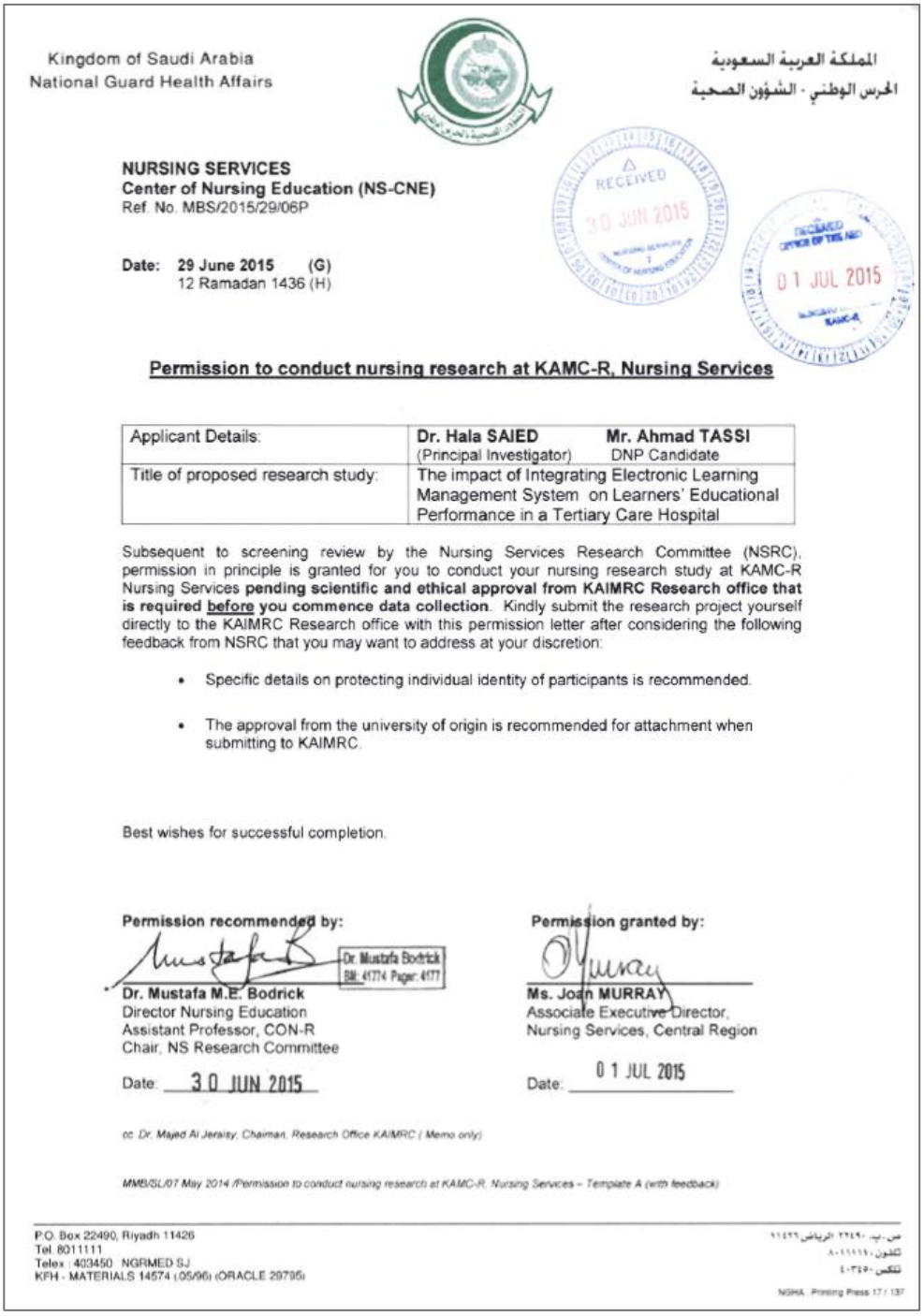
12. Which type of blood product is most often transfused for urgent Warfarin (Coumadin) reversal, when there is excessive bleeding?
    a. Packed RBCs
    b. CMV negative blood
    c. Fresh frozen plasma
    d. Platelets

13. Which of the following patients have a high risk of fluid overload post blood transfusion?
    a. Cardiac Patients
    b. Elderly patients
    c. Children
    d. All the above

14. With multiple transfusions of PRBC, patient is at risk for:
    a. Hyperkalemia
    b. Hypercalcemia
    c. Hypophosphatemia
    d. All the above

15. Fever, diaphoresis, hypotension, chest pain, back pain, anxiety, dyspnea and feeling of impending doom, are typical signs of _____ transfusion reaction.
    a. Anaphylactic
    b. Febrile
    c. Hemolytic
    d. Allergic

Appendix H: Permission to Conduct Nursing Research/ IRB Approvals



Kingdom of Saudi Arabia
National Guard Health Affairs

المملكة العربية السعودية
الحرس الوطني - الشؤون الصحية

RECEIVED
30 JUN 2015

01 JUL 2015

NURSING SERVICES
Center of Nursing Education (NS-CNE)
Ref. No. MBS/2015/29/06P

Date: 29 June 2015 (G)
12 Ramadan 1436 (H)

Permission to conduct nursing research at KAMC-R, Nursing Services

Applicant Details:	**Dr. Hala SAIED** (Principal Investigator) **Mr. Ahmad TASSI** DNP Candidate
Title of proposed research study:	The impact of Integrating Electronic Learning Management System on Learners' Educational Performance in a Tertiary Care Hospital

Subsequent to screening review by the Nursing Services Research Committee (NSRC), permission in principle is granted for you to conduct your nursing research study at KAMC-R Nursing Services **pending scientific and ethical approval from KAIMRC Research office that is required before you commence data collection**. Kindly submit the research project yourself directly to the KAIMRC Research office with this permission letter after considering the following feedback from NSRC that you may want to address at your discretion:

- Specific details on protecting individual identity of participants is recommended.
- The approval from the university of origin is recommended for attachment when submitting to KAIMRC.

Best wishes for successful completion.

Permission recommended by:

Dr. Mustafa Bodrick
Bill: 41774 Pager: 4177

Dr. Mustafa M.E. Bodrick
Director Nursing Education
Assistant Professor, CON-R
Chair, NS Research Committee

Date: 30 JUN 2015

Permission granted by:

Ms. Joan MURRAY
Associate Executive Director,
Nursing Services, Central Region

Date: 01 JUL 2015

cc. Dr. Majed Al Jeraisy, Chairman, Research Office KAIMRC (Memo only)

MMB/SL/07 May 2014 /Permission to conduct nursing research at KAMC-R, Nursing Services – Template A (with feedback)

P.O. Box 22490, Riyadh 11426
Tel. 8011111
Telex : 403450 NGRMED SJ
KFH - MATERIALS 14574 (05/96) (ORACLE 29795)

NGHA. Printing Press 17 / 137

Kingdom of Saudi Arabia
Ministry of National Guard - Health Affairs

المملكة العربية السعودية
وزارة الحرس الوطني - الشؤون الصحية

King Abdullah International Medical Research Center
(KAIMRC)

14572 1515 14527 irb@ngha.med.sa

IRB Office

MEMORANDUM

Reference #: IRBC/680/15

Date: **(G) 21 SEPTEMBER 2015**
(H) 08 Dhul-Al-Hijjah 1436

RYD-15-419810-106549

To: **DR. HALA SAIED**
Principal Investigator – SP15/159
Assistant Professor
College of Nursing
King Saud Bin Abdulaziz University for Health Sciences

AHMAD TASSI
Co-Investigator
DNP Candidate
Nurse Educator
Nursing Education

Ref No NBS/2015/29/06P

Subject: **RESEARCH PROTOCOL: SP15/159 – "The Impact of Integrating Electronic Learning Management System on Learners' Educational Performance in a Tertiary Care Hospital"**

This is in reference to your subject proposal which has been reviewed by the IRB on the 19th of September 2015 through the expedited review process. Upon recommendation of the Research Committee, and following the review of the IRB on the ethical aspects of the proposal, you are granted permission to conduct your study.

Your research proposal is **approved for one year** commencing from the above memo date with the following conditions:

TERMS OF APPROVAL:

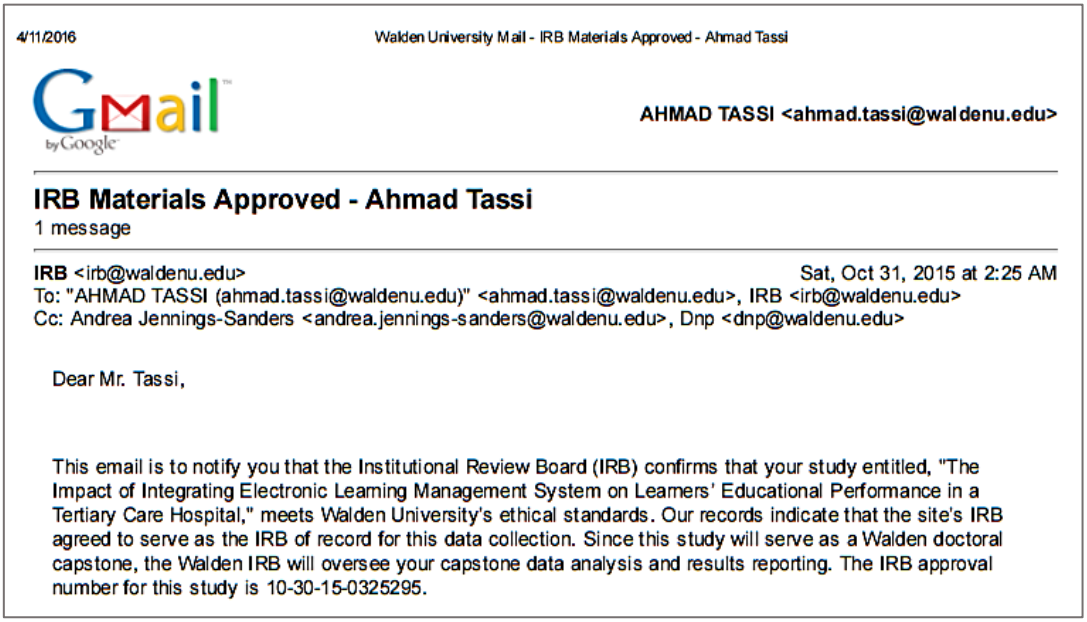
1. **Annual Reports**: Continued approval of this project is dependent on the submission of Annual Report. Please provide IRB with an Annual Report **determined by the date of your letter of approval**.
2. **Amendments to the approved project**: Changes to any aspect of the project require the submission of a Request for Amendment to IRB and must not begin without an approval from IRB. Substantial variations may require a new application.
3. **Future correspondence**: Please quote the project number and project title above in any further correspondence.
4. **Monitoring**: Projects may be subject to an audit or any other form of monitoring by KAIMRC at any time.
5. **Retention and storage of data**: The PI is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.
6. PI must sign consent following personal enrollment, copy of consent to be handled for participant and original must be kept in source document.

Prof. Amin Kashmeery
Chairman, Institutional Review Board (IRB)
Ministry of National Guard Health Affairs

Dr. Ahmed Al Askar
Executive Director, KAIMRC
Ministry of National Guard Health Affairs

Dr. Bandar Al Knawy
Chief Executive Officer
Ministry of National Guard Health Affairs

AK/AS/jbr



4/11/2016 Walden University Mail - IRB Materials Approved - Ahmad Tassi

Gmail by Google

AHMAD TASSI <ahmad.tassi@waldenu.edu>

IRB Materials Approved - Ahmad Tassi

1 message

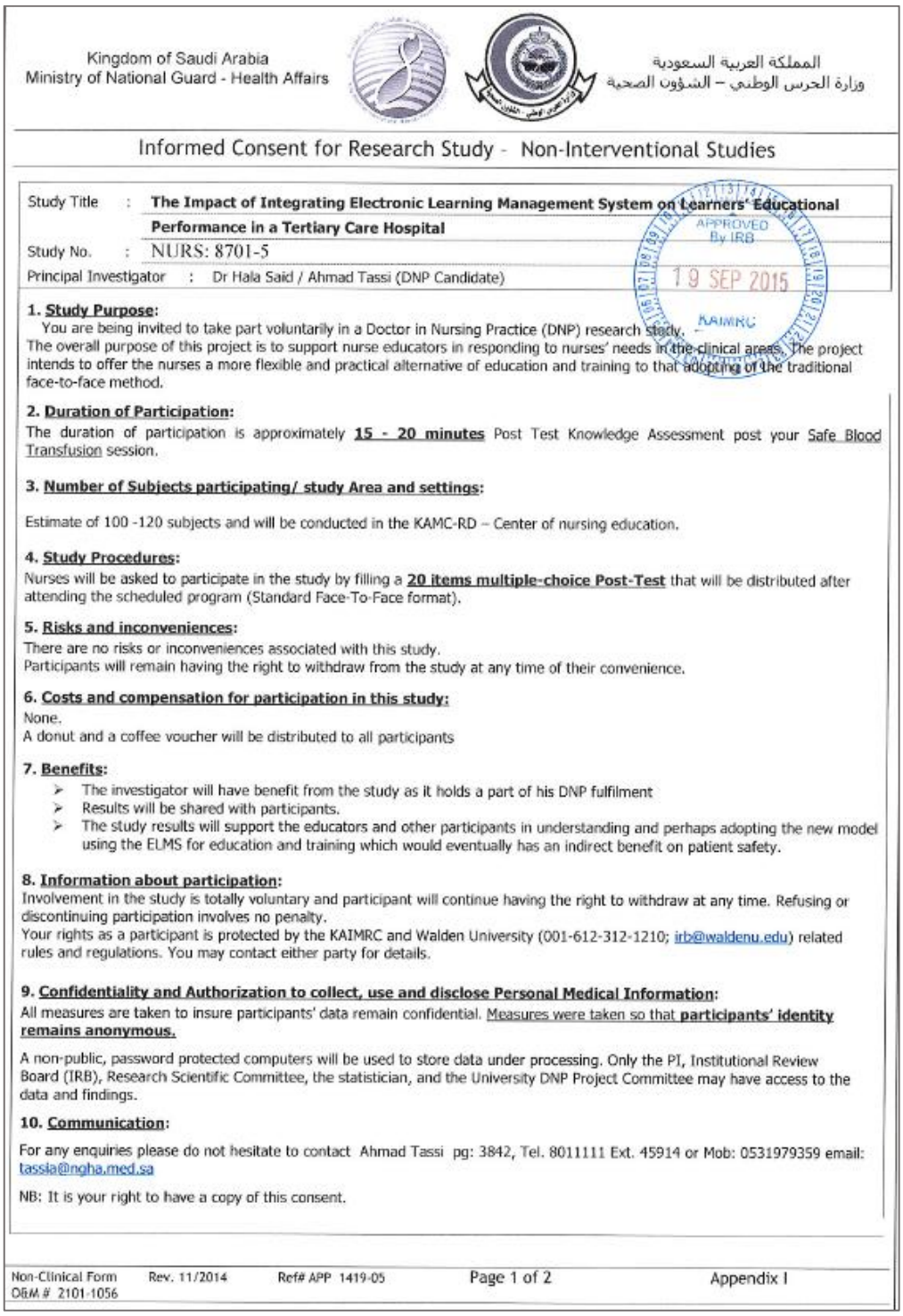
IRB <irb@waldenu.edu> Sat, Oct 31, 2015 at 2:25 AM
To: "AHMAD TASSI (ahmad.tassi@waldenu.edu)" <ahmad.tassi@waldenu.edu>, IRB <irb@waldenu.edu>
Cc: Andrea Jennings-Sanders <andrea.jennings-sanders@waldenu.edu>, Dnp <dnp@waldenu.edu>

Dear Mr. Tassi,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "The Impact of Integrating Electronic Learning Management System on Learners' Educational Performance in a Tertiary Care Hospital," meets Walden University's ethical standards. Our records indicate that the site's IRB agreed to serve as the IRB of record for this data collection. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is 10-30-15-0325295.

Appendix I: Informed Consents

Informed Consent – *Paper-based*



Kingdom of Saudi Arabia
Ministry of National Guard - Health Affairs

المملكة العربية السعودية
وزارة الحرس الوطني – الشؤون الصحية

Informed Consent for Research Study - Non-Interventional Studies

Study Title	:	**The Impact of Integrating Electronic Learning Management System on Learners' Educational Performance in a Tertiary Care Hospital**
Study No.	:	NURS: 8701-5
Principal Investigator	:	Dr Hala Said / Ahmad Tassi (DNP Candidate)

APPROVED By IRB 19 SEP 2015 KAIMRC

1. Study Purpose:
You are being invited to take part voluntarily in a Doctor in Nursing Practice (DNP) research study.
The overall purpose of this project is to support nurse educators in responding to nurses' needs in the clinical areas. The project intends to offer the nurses a more flexible and practical alternative of education and training to that adopting of the traditional face-to-face method.

2. Duration of Participation:
The duration of participation is approximately **15 - 20 minutes** Post Test Knowledge Assessment post your Safe Blood Transfusion session.

3. Number of Subjects participating/ study Area and settings:

Estimate of 100 -120 subjects and will be conducted in the KAMC-RD – Center of nursing education.

4. Study Procedures:
Nurses will be asked to participate in the study by filling a **20 items multiple-choice Post-Test** that will be distributed after attending the scheduled program (Standard Face-To-Face format).

5. Risks and inconveniences:
There are no risks or inconveniences associated with this study.
Participants will remain having the right to withdraw from the study at any time of their convenience.

6. Costs and compensation for participation in this study:
None.
A donut and a coffee voucher will be distributed to all participants

7. Benefits:
- The investigator will have benefit from the study as it holds a part of his DNP fulfilment
- Results will be shared with participants.
- The study results will support the educators and other participants in understanding and perhaps adopting the new model using the ELMS for education and training which would eventually has an indirect benefit on patient safety.

8. Information about participation:
Involvement in the study is totally voluntary and participant will continue having the right to withdraw at any time. Refusing or discontinuing participation involves no penalty.
Your rights as a participant is protected by the KAIMRC and Walden University (001-612-312-1210; irb@waldenu.edu) related rules and regulations. You may contact either party for details.

9. Confidentiality and Authorization to collect, use and disclose Personal Medical Information:
All measures are taken to insure participants' data remain confidential. Measures were taken so that **participants' identity remains anonymous.**

A non-public, password protected computers will be used to store data under processing. Only the PI, Institutional Review Board (IRB), Research Scientific Committee, the statistician, and the University DNP Project Committee may have access to the data and findings.

10. Communication:

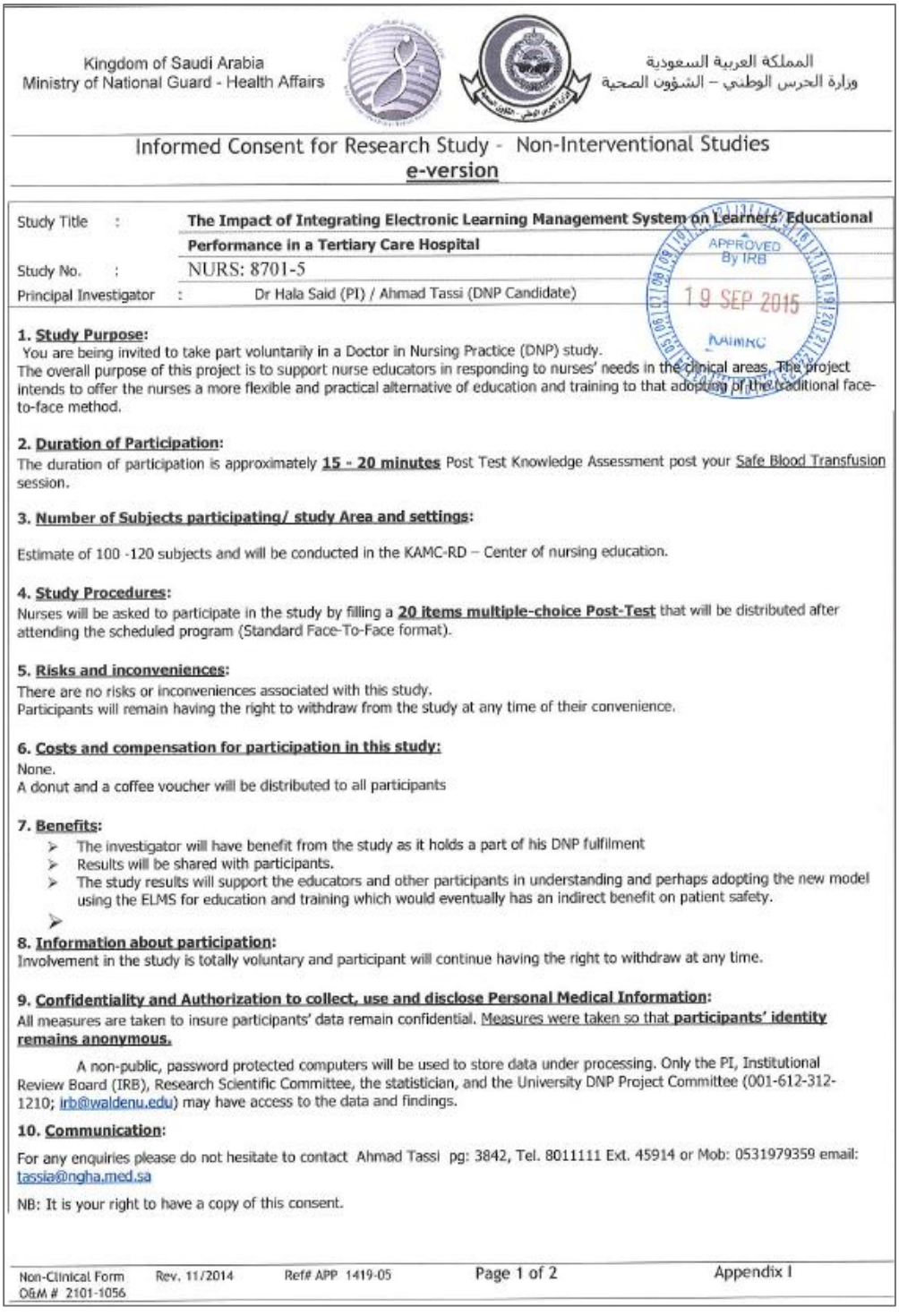
For any enquiries please do not hesitate to contact Ahmad Tassi pg: 3842, Tel. 8011111 Ext. 45914 or Mob: 0531979359 email: tassia@ngha.med.sa

NB: It is your right to have a copy of this consent.

By signing and dating this informed consent form, **I acknowledge my understanding** of the details mentioned above and **Agree** to participate in this study.

Participant Name	**Signature**	**Date**
NA	NA	NA
Name of the legal guardian	**Signature**	**Date**
Name of the witness	**Signature**	**Date**
Name of the Principal Investigator	**Signature**	**Date**

Informed Consent – e-version



Kingdom of Saudi Arabia
Ministry of National Guard - Health Affairs

المملكة العربية السعودية
وزارة الحرس الوطني – الشؤون الصحية

Informed Consent for Research Study - Non-Interventional Studies
e-version

Study Title	:	**The Impact of Integrating Electronic Learning Management System on Learners' Educational Performance in a Tertiary Care Hospital**
Study No.	:	NURS: 8701-5
Principal Investigator	:	Dr Hala Said (PI) / Ahmad Tassi (DNP Candidate)

APPROVED By IRB 19 SEP 2015 KAIMRC

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-

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A non-public, password protected computers will be used to store data under processing. Only the PI, Institutional Review Board (IRB), Research Scientific Committee, the statistician, and the University DNP Project Committee (001-612-312-1210; irb@waldenu.edu) may have access to the data and findings.

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For any enquiries please do not hesitate to contact Ahmad Tassi pg: 3842, Tel. 8011111 Ext. 45914 or Mob: 0531979359 email: tassia@ngha.med.sa

NB: It is your right to have a copy of this consent.

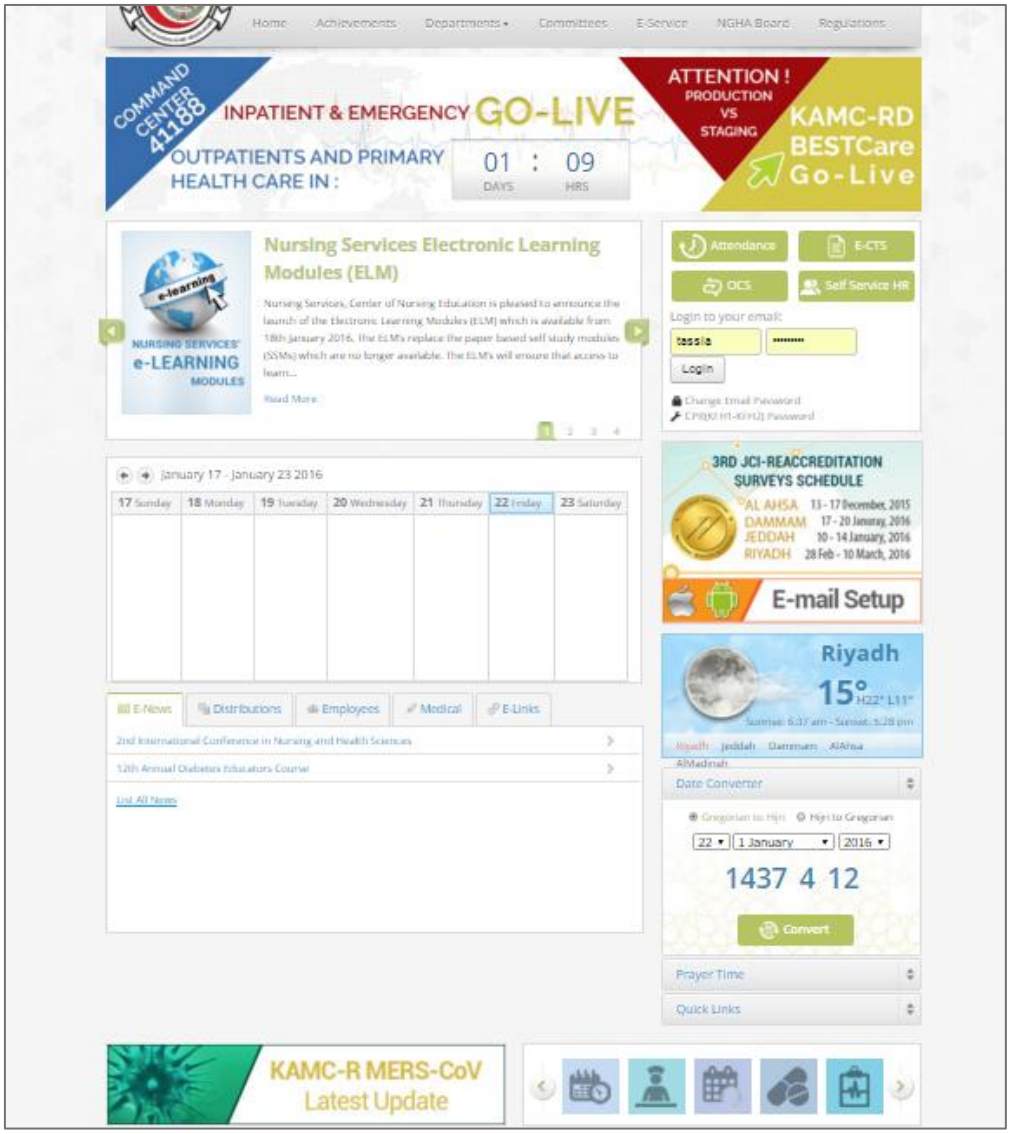
Please enter your electronic signature (email address) here after reading the statement to the right:_____@ngha.med.sa	By entering an email address in the box to the left, I am providing a digital signature confirming that I: ✓ Acknowledge my understanding of the details mentioned above ✓ Agree to participate in this study. ✓ Have read all of the instructions throughout this application

Name of the witness	Signature	Date
Name of the Principal Investigator	Signature	Date

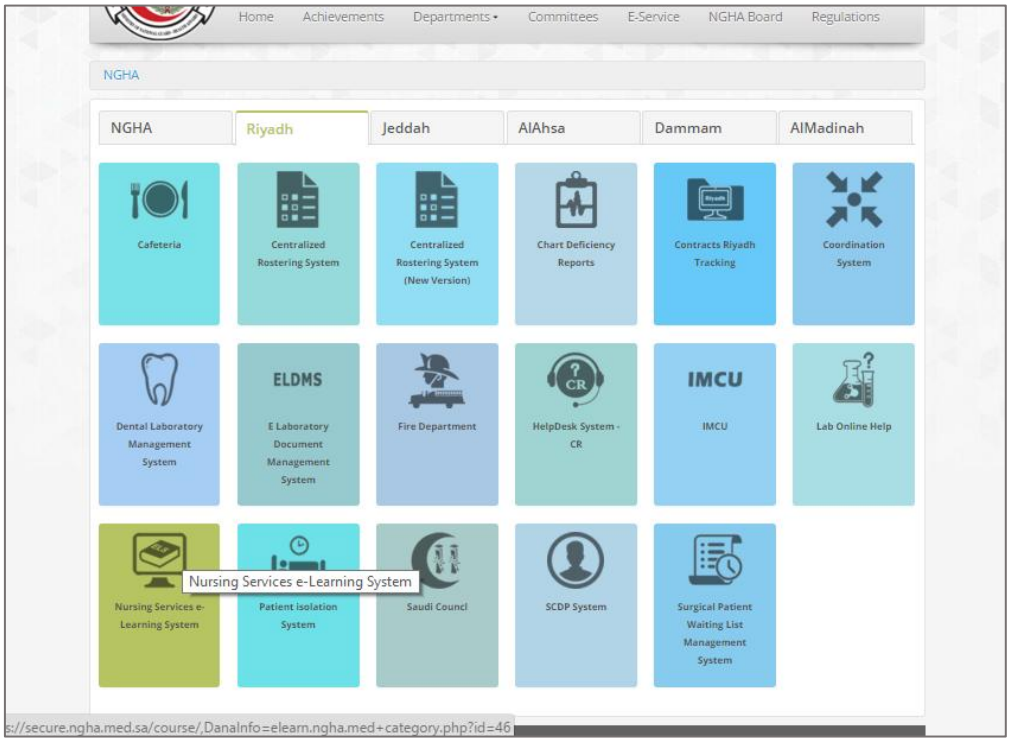
To proceed to the electronic Module/ Post-Test Knowledge Assessment, please click here →

Appendix J: Electronic Learning Modules (ELM)

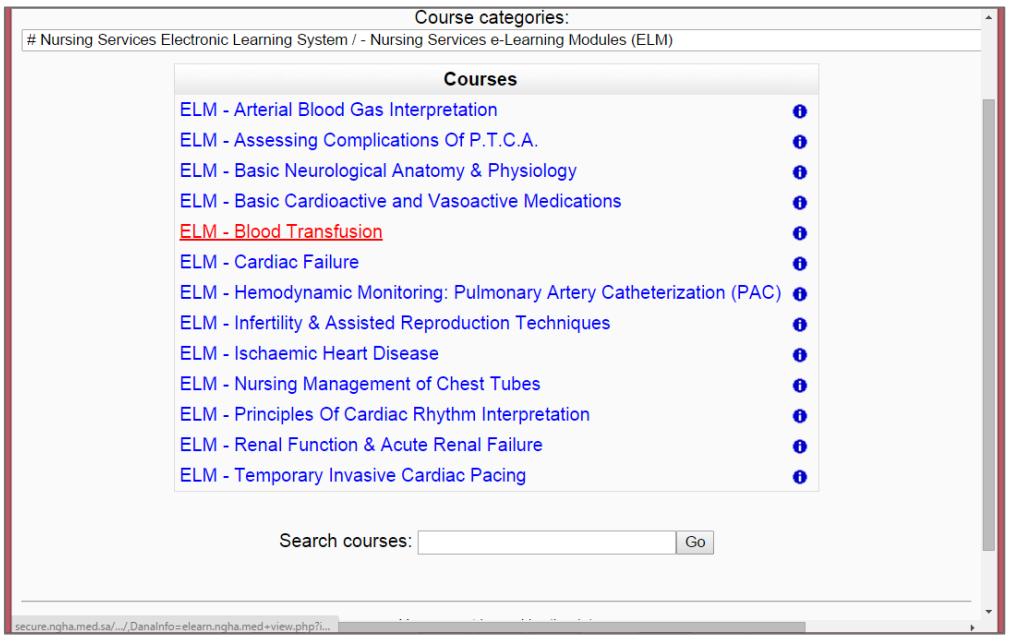
ELM Go-Live Announcement



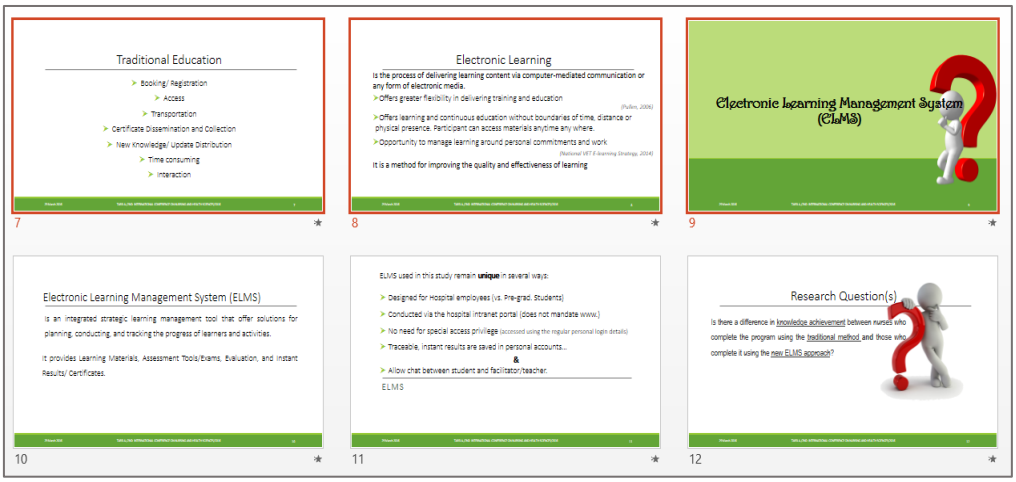
ELM Access

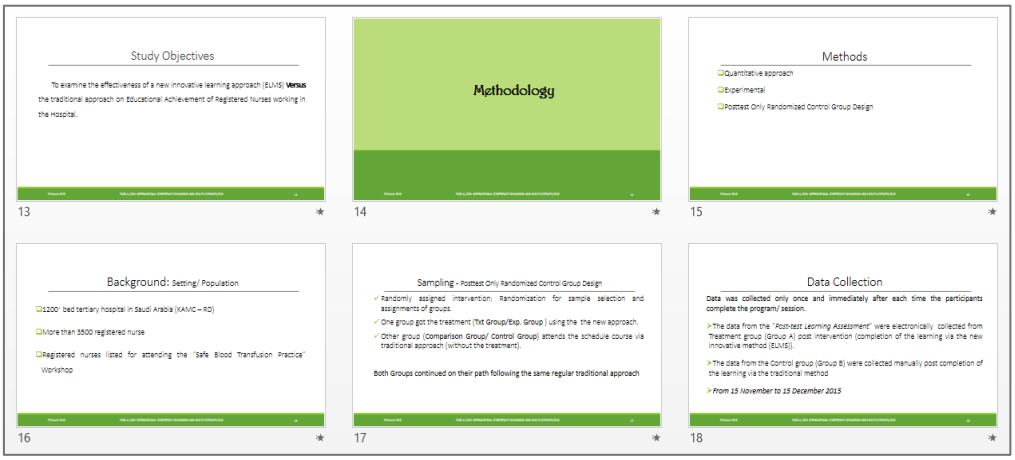


ELM Courses



Appendix K: The Project Power Point Presented at the Second International Conference in Nursing and Health Science – 29 March 2016




Study Objectives
To examine the effectiveness of a new innovative learning approach (ELMS) Versus the traditional approach on Educational Achievement of Registered Nurses working in the Hospital.
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Methodology
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Methods
Quantitative approach
Experimental
Posttest Only Randomized Control Group Design
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Background: Setting/ Population
1200' bed tertiary hospital in Saudi Arabia (KAMC – RD)
More than 3500 registered nurse
Registered nurses listed for attending the 'Safe Blood Transfusion Practice' Workshop
16
Sampling - Posttest Only Randomized Control Group Design
Randomly assigned intervention; Randomization for sample selection and assignments of groups.
One group got the treatment (Txt Group/Exp. Group) using the the new approach.
Other group (Comparison Group/ Control Group) attends the schedule course via traditional approach (without the treatment).
Both Groups continued on their path following the same regular traditional approach
17
Data Collection
Data was collected only once and immediately after each time the participants complete the program/ session.
The data from the "Post-test Learning Assessment" were electronically collected from Treatment group (Group A) post intervention (completion of the learning via the new innovative method (ELMS)).
The data from the Control group (Group B) were collected manually post completion of the learning via the traditional method
From 15 November to 15 December 2015
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Data Analysis
Independent Sample t-test
Testing the differences between the means and the distribution of the scores around the mean (variability)
SPSS
Measurements is for reaching identified outcome rather than the degree of change
19
Findings
20
The majority of the participants were Female Staff Nurses (90.2%) less than 40 years old (80.3%) with Bachelor degree (61.5%)
DEMOGRAPHIC DATA
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DEMOGRAPHIC DATA: GENDER
22
DEMOGRAPHIC DATA: AGE
23
DEMOGRAPHIC DATA: AREA
24


DEMOGRAPHIC DATA: LEVEL OF EDUCATION
DEMOGRAPHIC DATA: YEARS OF EXPERIENCE IN HOSPITAL
Distributions of the Characteristics across Experimental and Control Groups
GRADE /100 * GROUP
GRADE /100 * GROUP
GROUP STATISTICS _ INDEPENDENT SAMPLES t TEST
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T-TEST FOR EQUALITY OF MEANS. INDEPENDENT SAMPLES TEST
Summary and Conclusion
THANK YOU
References
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