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ORIGINAL RESEARCH

Are nursing students' clinical skills competency and self-confidence levels improved via video iPods? A randomized controlled pilot study

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Abstract

Background: Mobile technologies allow students the opportunity to enhance learning while away from the traditional classroom setting. However, educational outcome research is lacking in the use of mobile health (m-health) applications in healthcare professional practice development.

Objectives: The aim of this pilot study was to discover whether male and female urinary catheter insertion videos delivered via iPods increases students' skills competency and self-confidence levels.

Methods: A prospective replicated study including second year, semester two, undergraduate nursing student participants (NSP) (N=16) was conducted: nine control participants (no video iPods) and seven intervention participants (video iPods). Nursing students attending a mandatory skills class in a learning resource center (LRC) in a School of Nursing located in Northern California were asked to participate in the study. NSP completed a questionnaire regarding previous clinical exposure to urinary catheterizations and levels of competency and confidence in performing the skills prior to taking a required skills course. Directly following the completion of the questionnaire, the participants' viewed a professional video and a clinical faculty demonstrating the skills. Thereafter the NSP were provided practice time with evaluative feedback. At the completion of the class, the intervention group was provided video iPods and the control group was afforded no technology for a period of two weeks. Following the two weeks, the NSP completed a follow-up questionnaire and a clinical evaluation of their urinary catheterization skills in the LRC.

Results: Close to zero variation in urinary catheterization competency scores were determined because all of the NSP scored high in this area and, therefore meaningful comparisons were not determined. The confidence levels for performing the catheterization skills did not significantly change by group, procedure, or time and neither were the two-way interactions between group and time, nor between procedure and time significant.

Conclusions: Video iPods may be used to enhance nursing skills. However, the results of this pilot study do not suggest a significant change in competency or confidence levels in performing the clinical skills. Further investigation is necessary because increasing the number of participants, video-viewing time, and monitoring the length of time-on-learning may have a positive influence on future student affect and learning outcomes.

Key words

Nursing education, Mobile technology, Urinary catheterization

1 Introduction

Nursing students (NS) are required to learn, practice, and be evaluated on clinical skills at a School of Nursing Learning Resource Center (LRC) prior to practicing skills in the clinical setting with instructor supervision. Registered Nurse (RN) faculty members provide NS with cutting-edge human-patient simulations as a part of the nursing education curriculum (Nursing Education Perspectives). And Virtual Learning Environments (VLE), such as “CliniSpace,” [2] and other VLE [3] are becoming popular adjunct technologies in Schools of Nursing and Medicine worldwide. Since physical space is limited in the LRC, one idea is to provide NS clinical-skill videos via a mobile device, such as the video iPod®, in order to enhance student learning anytime and anywhere. The fact one out of 10 mobile technology users in the United States watch a video on a mobile device each day supports this novel idea for potential learning [4]. The aim of this replication study is to determine if the delivery of two clinical skills videos via a mobile device has a positive impact on nursing students’ self-confidence and competency levels in performing the skills compared with medical interns’ self-confidence and competency levels determined in the original study conducted in Auckland, New Zealand [5].

1.1 Background

High quality nursing education materials delivered via mobile devices is a student friendly method that overcomes concerns of time, educational costs, and physical classroom space [6]. In 2009 there were 45.8 million millennial students (ages 18-28) living in the United States and they are considered technologically savvy, experiential learners, achievement oriented, creative, confident, conventional, sheltered, team oriented and coined as “special” [7-9]. Furthermore, Raine [9] states 69% of the millennials own an iPad (tablet computer) or MP3 player. Kvavik [10] reports undergraduate freshmen and seniors downloaded or listened to music or videos via technology one-to two-hours per day. Furthermore, these same students reported the highest use of technology was in support of their academic activities. Therefore, the use of mobile multimedia technologies for today’s college-age student is noteworthy because of the convenience they afford and the educational content that may be downloaded. Moreover, mobile health (m-health) technologies may change the way educators and students share media and this in turn will shorten the “digital divide” and empower nurse educators to embrace ubiquitous technologies. Furthermore, today’s multidisciplinary educators are interested in learning how people use mobile devices and even how mobile connectivity is changing the ethnic composition of this very frequently “connected” population [9].

In higher education, audio and video productions prove effective in enhancing student-learning outcomes and increase student satisfaction [6, 11-14]. Moreover, Apple Computer’s iPod and iPad are becoming a part of healthcare professional education and patient-centered care [15]. Some of the advantages of using mobile technology in healthcare education are point-of-care teaching, preparing for class and clinical work, and immediate access to a podcast/vodcast at any given time or place. Evidence of how effective educational material delivered via mobile devices for healthcare professional development is lacking and empirical research is needed to evidence the use of mobile technology devices.

The use of video iPods in healthcare professional education and patient care came about in 2005 when “collaboration ware,” also known as Web 2.0 applications (Blogs, Wikis and Podcasts) made their debut [16] and a handful of physician and nurse educators started to use the tools for educational and clinical purposes [6, 17]. Web 2.0 technologies for higher education learning are blossoming as evidenced by current publications [18, 19]. However, empirical research surrounding the popular use of Web 2.0 applications is truly in its infancy [5]. Boulos and Wheeler [20] note the potential fit for Web 2.0 applications within the healthcare milieu and emphasize the need for novel research evaluation and testing in order to evidence use of these technologies in enhancing medical/nursing education and supporting patient education and care. It is this author’s aim to investigate the pedagogical outcomes behind the increased use of these popular new technologies in higher education, specifically nursing education.

1.2 Rationale

The traditional Socratic model for teaching nursing professional clinical skills is no longer possible due to the shortage of faculty [21] and limited clinical placements in the community. However, the traditional method of providing instruction may be enhanced with mobile technology devices that support and encourage a student-centered approach to learning [6, 11]. Also, active engagement with mobile learning devices and rigorous content supports the necessary attainment of information technologies competencies required of today's nurse professionals [22, 23].

2 Purpose

The intention of this replicated pilot study was to determine whether male and female urinary catheter insertion videos produced by the LRC RN staff and provided via video iPods would increase nursing students' competency and self-confidence levels. Medical interns' skills competency and confidence levels in inserting urinary catheters were investigated in a prospective study at the University of Auckland and, this study was designed to replicate the New Zealand based study and compare outcomes [5]. The insertion of a urinary catheter is a critical and frequent nursing skill that requires knowledge and practice in order to prevent harm to patients. Specifically because urinary catheterizations may contribute to nosocomial infections [24] and, therefore the design of this study was based on the hypothesis that NS provided a familiar mobile device in order to view educational media over a period of two weeks would have increased competency and self-confidence levels while performing future urinary catheterizations.

3 Research questions

The study was designed around these questions: What are NS' experiences in performing male and female urinary catheterizations prior to a skills course? What are NS' experiences in seeing, assisting or performing male and female urinary catheterizations two weeks following a skills course? What are NS' competency and self-confidence levels in demonstrating male and female urinary catheterizations prior to a clinical skills course? What are nursing students' levels of competency and self-confidence in performing male and female urinary catheterization after a clinical skills course demonstration and practice period? What are nursing students' levels of competency and self-confidence in demonstrating male and female urinary catheterization (comparing the control and intervention groups) at two weeks following the clinical skills course?

4 Subjects and methods

The prospective study sample consisted of 16, second-year (16-26 years old), semester-two, female nursing students enrolled in a required skills course lasting a period of 15 weeks in the 2009 fall semester. Nursing student participants (NSP) were assessed for eligibility and no one was excluded nor did anyone decline to participate. The NSP were randomized into two groups. The control group (n=9) received no allocated intervention and the intervention group (n=7) received the allocated technology intervention. An Institutional Review Board of the Protection of Human Subjects approval was obtained and consent to participate in the study was secured by all participants prior to the commencement of the study. According to the International Committee of Medical Journal Editors (ICMJE) [25], it is not necessary to register randomized control trials that involving healthcare providers. And, therefore this trial was not registered. A power analysis was not conducted for this pilot study and, the NSP were assured participation in the study was voluntary and would not have a deleterious effect on any course grades or future employment at the university.

4.1 Precourse assessment: skill experience

At the onset of the daylong class the NSP were asked to fill out a pre-course skill experience questionnaire that was developed by researchers conducting a similar study [5] in order to evaluate experience and self-confidence around male and female urinary catheterizations. The “pre-course” questionnaire question set is presented in Table 1.

Pre-existing knowledge was measured in order to control for confounding variables. Validity and reliability of the pre-course questionnaire were not assessed. The questionnaires were collected from the nursing students and kept in the researcher’s locked office cabinet. The participants were assured the questionnaire responses would be kept confidential and the data would be kept for five years before being shredded.

4.2 Competency and self-Confidence levels

Directly following the completion of the questionnaire, the NSP viewed a professionally copyrighted 30-minute video showing the insertion of urinary catheters in the LRC on television monitors. Thereafter, a RN faculty member demonstrated the catheterization procedures on a mannequin in the LRC for approximately 10-minutes. Directly following the training time the students were given the opportunity to practice each skill before being evaluated by the same faculty member who demonstrated the skill to the participants. All of the participants engaged in the practice session and each practice session was on average 10 minutes for each skill. The total training time was approximately 60 minutes. The RN faculty member assessed each participant’s demonstration skill level by using a 16- and 15- item paper-based competency skill evaluation tool for the male and female catheterization procedure directly after the practice session. This form of assessment gleans high reliability and validity because of its subjectivity [26]. It was determined the participants’ competency levels for performing the skills were high because each participant satisfactorily demonstrated insertion of a urinary catheter into the male and female LRC mannequins against the aforementioned competency check lists.

Table 1. Pre-course questionnaire question set

Number	Questions
1.	How much exposure have you had with urinary catheterizations?
2.	How many times have you performed a male and/or female urinary catheterization?
3.	Where did you gain experience with this skill?
4.	Who taught you about this skill?
5.	If you were asked to do each of these skills on patients right now, what would be your level of confidence for each skill?
6.	How necessary is it that you master these skills?
7.	To what extent will you make use of this procedure in future practice?
8.	What is your current level of tiredness prior to receiving training for these skills?
9.	In your own words, what do you expect from this skills course (e.g., do you expect to walk away confident enough to do any of the procedures without direct supervision?

The NSP’ competency scores were calculated by averaging the procedural steps for the male (16 items) catheterization skill and the female catheterization (15 items) skill. Participants either correctly or incorrectly performed each step of the procedure listed on the skills metric and therefore were deemed competent in skill acquisition. The clinical steps involved in the urinary catheterization evaluation were a mock explanation of the procedure to the patient (mannequin) and included the standard sterile urinary catheterization policy and procedure for male and females. The NSP answered questions

regarding self-confidence in performing the male and female urinary catheterization procedures prior to the course on the questionnaire, directly following the practice session, and at the two-week follow up course.

Directly following the instructor's evaluation process the NSP were randomly assigned to either a control or intervention group. A third party not involved in data collection consecutively numbered 16 envelopes containing an assignment to the control (no technology) or intervention (video iPod) group. Following agreement to participate in the study and written consent obtained the NSP were irreversibly randomized by being provided a sealed envelope. The intervention group members were provided unlimited access to R. N. faculty produced male and female urinary catheterization videos via a video iPod for two weeks (see www.m2hnursing.com). At the time of providing the video iPods to the NSP, instructions were provided and the NSP' questions regarding the use of the iPods were answered. In order to control for confounding variables the control group were not afforded any technology and, the intervention group members were discouraged from sharing the videos via the iPods with their peers or discuss the learning process.

Following two weeks, all NSP reconvened in the LRC and filled out a two-week follow-up questionnaire measuring exposure to urinary catheterizations and level of confidence since the onset of the study. Directly thereafter the participants were assessed against the same set of skill metrics used prior to the intervention (video iPods) and by the same faculty who evaluated the participants at the onset of the study. The faculty evaluator was blinded to which group of participants were being assessed. And, once again the NSP demonstrated high competency and each NSP passed the skill assessment.

The NSP "experience" score was created differently for the pre- and post-intervention events. For the pre-intervention, the variable was the number of times the participant had performed the procedure in the clinical setting. Whereas, for the post-intervention variable (two-week follow-up) this was evaluated and compared in two ways: the first comparison was just the number of times the participant had performed the catheterization and the second way was the mean scores were calculated from the number of times the participants had seen, performed, or assisted with the urinary catheterization. Participant competency scores were not created because all of the student participants had high scores for competency. Students were evaluated for competency when all had achieved it and, therefore there was almost zero variation in scores and meaningful comparisons were unable to be made following the data collection. The questions regarding the NSP' level of confidence were assessed at the pre-skills course, immediate post-skills assessment, and at the two-week follow-up course in the LRC by using the same questions at each time interval.

4.3 Results

All datas were statistically analyzed by using SPSS version 18 (IBM Corporation, Somers, NY, USA) directly following data collection and demographic data as well as the male and female urinary catheterization experience variable were determined. There were nine females in the control group and seven females in the intervention group. The age range for all participants was 16-26 years.

4.4 Precourse evaluations

4.4.1 Skill experience

Prior to the skills course the student participants' experience related to the number of times "performing" a urinary catheterization was measured and, at the post intervention (two-week follow-up), the number of times the participants had "seen", "assisted" or "performed" since the course was included in the data collection (see Table 2). For two questions at the "before the course" point of time in the study, only five responses were obtained from the NSP.

Table 2. Nursing student participants' self-report of urinary catheterization skill experience in terms of the number of times seen, assisted, or performed the urinary catheterization procedure

Point of time in study	Catheterization procedure	Control group				Intervention group			
		0	1-2	3-4	Total	0	1-2	3-4	Total
Before course (Pre-intervention)	Male	7	2	0	9	3	2	0	5
	Female	7	2	0	9	3	2	0	5
Seen since course (2-week follow-up)	Male	2	5	2	9	4	1	2	7
	Female	1	7	1	9	4	1	2	7
Assisted since course (2-week follow-up)	Male	5	3	1	9	6	1	0	7
	Female	5	4	0	9	5	2	0	7
Performed since course (2-week follow-up)	Male	2	4	3	9	4	2	1	7
	Female	2	4	3	9	4	2	1	7

4.4.2 Assessment

The analysis identified a range of interesting NSP responses from the pre-course assessment tool that were not captured by quantitative outcome measures. When asked who has taught you about male and female urinary catheterizations the majority of the NSP stated Registered Nurse (RN) preceptors at the hospital. The majority of the NSP stated it is extremely important to master the skill procedure for both types of urinary catheterizations. And, when asked to what extent will you make use of the male and female urinary catheterizations the majority of the NSP stated a "strong" importance of knowing and performing the skill in clinical practice. The researcher was concerned about the NSP fatigue level at the time of data collection because it may have an impact on the outcomes and on average a "neutral" response was provided about NSP fatigue levels.

When asked to describe what the NSP expected from the skills course in regards to increasing confidence to the level of performing the skills without direct supervision some of the self-reported responses were: "After this course I expect to be highly proficient in the skills at hand and be able to perform them without assistance." And, "I expect to walk away feeling confident in performing these procedures." Furthermore, a NSP stated: "I expect to be able to confidently perform urinary catheterization on a male and female patient without supervision and using sterility and know how to act should an unexpected outcome occurs." Also, a NSP noted: "I expect to boost my self-confidence, but we still practice on a dummy which is different from a live person" Another NSP response was an expectation to confidently "walk away" from the skills course prepared enough to perform the learnt skills without direct supervision.

4.4.3 Competency and confidence Levels

The NSP' skills competency levels were determined to be very high at the onset of the study and therefore subsequent evaluations were not performed when it was determined all NSP had achieved skill competency. Since there was almost zero variation in the initial NSP scores, meaningful comparisons could not be found from this study.

The NSP' confidence levels were evaluated at the pre-, post- and two-week follow-up course for the male and female urinary catheterization skills. The NSP mean confidence values are found in Table 3. Without apparent reason two NSP in the intervention group did not answer the pre-course male or female confidence level questions. Over time the mean confidence levels for performing the male and female procedures increased for both groups. The changed scores do not indicate a practical significance. However, the qualitative results highlighted in the pre-course questionnaire indicate the

NSP stated a “belief” they would be “more confident” following the skills course. However, the NSP confidence scores are not in alignment with the NSP “belief” of increased self-confidence. A larger sample size may glean different results and offer clinical significance when this pilot study is replicated.

Table 3. NSP’ urinary catheterization confidence scores by procedure (N = 16)

Skill confidence by procedure	Point of time in study	Control group mean (SE)	Intervention group mean (SE)
Female catheterization	Pre-course	1.44 (0.73)	2.00 (0.71)
	Post-course	2.89 (0.78)	2.86 (1.07)
	2-week follow-up course	4.11 (0.93)	3.57 (1.27)
	Change score	2.67	1.57
Male catheterization	Pre-course	1.44 (0.73)	2.00 (0.71)
	Post-course	2.78 (0.97)	2.71 (0.95)
	2-week follow-up course	4.33 (0.71)	3.86 (1.07)
	Change score	2.89	1.86

The three-way interaction between group (control vs. intervention), procedure (male vs. female) and time (pre-, post- and follow-up) for the NSP catheterization skill confidence levels were not significant. In regard to the NSP catheterization skill confidence levels for two-way interactions between group and time or procedure by time there was no statistical significance. The results are illustrated in Table 4.

Table 4. Interaction effects for NSP’ urinary catheterization skill confidence levels (N = 16)

Interaction variables	Analysis of variance	P value
Group by procedure by time	F1,12.0 = 0.26	0.10
Group by time	F1,12.0 = 1.07	0.32
Procedure by time	F1,13.0 = 3.06	0.10

5 Discussion

Bhandari [27-28] reports mobile applications in healthcare professional training and professional development are on the rise and actually may be making the practice of medicine safer. Robust outcome measurements are lacking in the effectiveness of mobile healthcare applications for nursing and physician training. However, anecdotal reports highlight how the use of iPods in healthcare professional training worldwide provides “easy and quick access to learning material” [7]. This innovative pilot study was conducted with the intent to discover if mobile iPods delivering healthcare skill videos would actually increase NSP competency and self-confidence levels in performing important skills based on the educational premise transference of theoretical knowledge will decrease harm to patients.

The primary limitation associated with this study is the quite small sample size. Other concerns that need to be noted are the effects of the actual “time-on-viewing” (learning) each skill video, location of learning the skills (quiet or noisy area) and the fact millennial students tend to multitask while learning. The amount of time (two weeks) the intervention group

was allotted the use of the video iPods was determined by the academic and LRC skills schedule. In the future the amount of time the NSP intervention group will have the video iPods will be increased. Another factor to take into consideration is the Hawthorne effect which may have played a role in the NSP being super attentive to being competent in both skills because they were being viewed/evaluated as a research participant.

The NSP experience in performing male and female urinary catheterizations prior to the mandatory skills course were determined and the majority of the NSP (N = 10) reported no experience in performing the skill prior to the course, therefore indicating these NSP did not have a prior experience that may influence the competency level at the time of the post-course evaluation. At the two-week follow-up time in the study a majority of the NSP in the control group reported “seeing” the skills one to three times, whereas the majority of the NSP in the intervention group reported not seeing the skills procedures since the skill course class. The majority of the NSP in both the control and experimental groups reported not “assisting” in the procedures since the skills course. And the majority of the NSP in the control group reported “performing” the procedures one to two times since the end of the skills course, whereas the majority of the NSP in the experimental group reported not performing the skills since the end of the skills course. Perhaps if the control group NSP had access to the videos via the iPods there may be a significant difference in confidence scores because they actually had more opportunities to perform the skill during the experimental part of the study. Also, the NSP confidence levels by both groups in demonstrating the catheterization skills prior-, post- and at two-week follow-up were not significantly different.

The results of this replication study are different from the study conducted in New Zealand [5]. Hansen and colleagues [5] report “urinary catheterization skill competency declined over time in the control group for both male and female catheterizations, whereas the competency level was stable in the intervention group for both procedures” (p.8). Unlike other thoughts that competency is likely to decline over time, competency stayed the same throughout this study. And, moreover the competency variation in this study was negligible and all NSP were deemed competent in the skill at the onset of the study. Unlike the study conducted by Hansen et al. (2011) there were no interaction for group by time and the confidence levels for performing either skill did not differ significantly over time. This finding was different when compared with the results in the Hansen et al. (2011) study that involved medical interns (N = 21).

6 Conclusion

The use of mobile devices, such as video MP3 players, tablet computers and smart phones, are providing and supporting new kinds of learning in healthcare professional education, clinical practice, and patient teaching [28]. These user-friendly, convenient, and popular mobile devices are changing educators’ and students’ expectations regarding the availability of information and media. When these mobile devices are combined with mindful, rigorous, and goal directed educational material students are engaged and interact with the learning material in a purposeful manner. The results of this small experimental pilot study indicate no statistically significant change in the NSP confidence levels nor in terms of being able to do the skill, however future students may benefit from having convenient access to the skills videos on the video iPods in the clinical setting just prior to performing the skill in the clinical setting. Furthermore, clinical faculty may use m-health technologies to test students’ knowledge prior to performing the skill on patients. Healthcare provider students’ confidence levels in performing clinical skills may be influenced by the mobile revolution when a larger group of students have access to the mobile devices and “time-on-viewing” are tracked over a longer period of time. Continued empirical research is necessary regarding the use of mobile devices in order to determine summative and formative assessments of student learning in higher education. There is evidence the ever-changing media ‘ecosystem’ is influencing the way healthcare providers, students, and patients receive, share, construct and disseminate information [9, 11, 29]. The mobile video technology when combined with social media, such as You Tube, Facebook, Twitter and Skype, may provide more powerful teaching and learning outcomes. Moreover, it is healthcare educators and practitioners responsibility to enable originality, test innovation, and “truly see” new ideas, technologies, and possibilities in enhancing student and patient learning outcomes in today’s global environment.

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