Does Change in Pelvic Examination Sequence Promote Cervix Visualization Among Advanced Practice Nursing Students?

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Author Note

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Abstract

Purpose: The purpose of this clinical inquiry project was to determine if there is a difference in the ease of cervix visualization when the bimanual examination is performed prior to the speculum examination among advanced practice registered nursing (APRN) students.

Data Sources: Thirty seven participants were recruited from a convenience sample of APRN students participating in a pelvic skills lab in an advanced assessment course. Seventeen participants performed a pelvic examination with bimanual occurring before speculum examination. The remaining 20 participants performed a pelvic examination with speculum examination occurring before the bimanual examination. Visualization of the cervix was measured by participants' responses to the *Ease of Cervical Visualization Questionnaire II*. Results were analyzed using a *Mann Whitney U* test for independent samples. No statistically significant difference was detected in ease of cervical visualization between the bimanual-first technique group (*Md*=4.0, *n*=17) and the speculum-first technique group (*Md*-3.5, *n*=20), *u*=150, *z*=-0.615, *p*=.539, *r*=.101 [*r* = effect size]. The number of times the speculum was repositioned was positively correlated with the perceived difficulty of cervix visualization (Spearman *rho* .56, *p* = 01, *n* = 20).

Conclusions: The results of this study did not show a significant difference between the groups regarding the ease of cervical visualization. The participants, however, who palpated the cervix prior to speculum examination, reported decreased instances of speculum repositioning, which was correlated with an increased ease of visualization of the cervix.

Does Change in Pelvic Examination Sequence Promote Cervix Visualization Among Advanced Practice Nursing Students?

The pelvic assessment of the female reproductive organs is a difficult skill for a novice or a student examiner to acquire (Carr & Carmody, 2004). For the majority of students, learning how to perform the pelvic examination causes stress and anxiety (Hendrickx et al., 2005; Pugh, Obadina, & Aidoo, 2007).

Physical assessment educators use many different teaching strategies to help students in advanced physical assessment classes learn to perform pelvic assessments on female patients (Levi, 2008; Theroux & Pearce, 2006). Two methods, in particular, have proved effective: (a) standardized patients and (b) mannequin-based simulators. Other strategies used to teach the pelvic examination include didactic lectures, instructional videos, student peer examinations, and hands-on examinations of female patients under the guidance of a preceptor (Dull & Haines, 2003). Standardized patients or clinical teaching associates are women who have been trained to instruct and support students who are learning to perform a pelvic examination (Theroux & Pearce, 2006). In addition, standardized patients facilitate learning the pelvic examination by providing feedback to students during the procedure regarding the student's technique (Theroux & Pearce, 2006). Novice nurse practitioner students who performed their first pelvic examination on standardized patients while a preceptor was present reported increased comfort with performing the pelvic examination and increased confidence in exam techniques (Carr & Carmody, 2004), and a positive learning experience with standardized patients (Theroux & Pearce, 2006).

Instructors have also used mannequin-based simulators to teach gynecologic procedures, such as the pelvic examination technique (Pugh, Heinrichs, Dev, Srivastava, & Krummel, 2001). A study by Pugh et al. (2007) revealed that when novice students practiced on simulators prior to performing examination on standardized patients, their anxiety levels decreased and their performance levels improved. Although the proper performance of pelvic examination increases patient comfort and improves the quality of specimen collection (Carr & Carmody, 2004), evaluation of the effects of different sequencing of pelvic examination on patient comfort has not been examined in the medical literature. Ryden (2002) listed the standard sequence for performing a female pelvic examination as: (a) an inspection of the external genitalia, (b) a speculum examination, and (c) a bimanual examination. When an examiner is unable to visualize the cervix promptly with a first attempt at speculum examination or by manipulating the depth or the angle of the speculum, the clinician has been instructed to remove the speculum, perform a bimanual examination, and then reinsert the speculum in an attempt to visualize the cervix (Carter, 2010; Heath & Sulik, 2010). Many researchers noted that visualization of the cervix, an essential part of the pelvic examination, is a skill that students often struggle to acquire (Siwe, Wijma, Stjernquist, & Wijma, 2007). Carter (2010) reported a significant mean difference on number of times specula required repositioning to visualize the cervix and ease of cervix visualization among APRN students. Results favored performing the bimanual examination first rather than after speculum examination. Pugh et al. (2007) proposed that creative methods could enhance the novice performance of the pelvic examination and improve the comfort of the patient experiencing the examination.

Purpose

The purpose of this clinical inquiry project was to determine if there is a difference in the ease of cervix visualization when the bimanual examination is performed prior to the speculum examination. The study participants were advanced practice registered nursing (APRN) students who performed pelvic examinations in an advanced practice physical assessment course. During this study, students were randomized into two groups. Group one (the bimanual-first group) performed the bimanual examination prior to performing the speculum examination. Group two (the speculum-first group) performed the speculum examination first.

Each student who participated in this study anonymously completed the *Ease of Cervical Visualization Questionnaire II* (included in Appendix A) immediately after performing the pelvic examination. The goal of this project was to determine if changing the sequence of the bimanual and speculum examinations helped students learn the pelvic examination procedure.

Problem Statement

Learning to perform the pelvic examination can be challenging. The procedure often causes anxiety for patients and clinicians and students alike. Many methods have been suggested to help students learn how to perform a pelvic examination correctly.

As described previously, for many years standard pelvic examinations have been performed with the speculum examination occurring before the bimanual examination. This examination sequence was based on the belief that the vaginal lubricant used during the bimanual examination would obscure or interfere with the interpretation of the Pap smear. Several recent studies, however, (Amies, Miller, Lee, & Koutsky, 2002; Griffith, Stuart, Gluck, & Heartwell, 2005) have reported that water-based lubricants do not adversely impact the analyses of cervical cytologic specimens, as also cited by Carter, Rad, Schwarz, Van Sell, &

Marshall, 2011. Performing the bimanual examination before the speculum examination could: (a) facilitate cervix visualization, (b) increase clinician proficiency during the procedure, and (c) decrease discomfort for the patient (Carr & Carmody, 2004; Carter, 2010).

Research Question

Will performing the bimanual examination prior to the speculum examination ease cervical visualization among APRN students when compared to APRN students performing the speculum examination first?

Hypothesis

There is a statistically significant increase in the ease of cervical visualization when the bimanual examination is performed prior to the speculum examination (compared to the standard method of performing the speculum examination first).

Null Hypothesis

There is no significant difference in the ease of cervical visualization when the bimanual examination is performed prior to the speculum examination (compared to the standard method of performing the speculum first).

PICO Question

In advanced practice nursing students, does changing the sequence of the pelvic examination positively influence cervical visualization when compared to standard techniques?

Conceptual Framework

This study is based on the conceptual framework of haptic perception. Haptic perception is defined as using one's hand to perceive the physical world and has two components: (a) touch (tactile perception) and (b) motion of the body (kinesthetic perception) or active touch (Gentaz, Baud-Bovy, & Luyat, 2008; Siwe, 2007). During the active exploration of the hand, perceptual

functions and motor functions of the hand and body are linked (Flannigan & Lederman, 2001). These linked functions transmit the information that the person desires to know and create a mental image of the object in the person's mind (Flannigan & Lederman, 2001). Touching an object helps to determine the texture, size, and shape of an object (Siwe, 2007). Therefore, when an object is both touched and visualized, more rapid perceptions can be made than when touch and visualization are used separately (Siwe, 2007).

Haptic learning is performed when students use their hands to explore objects. Many learners use this active learning technique to maintain attention and to facilitate the learning process (Siwe, 2007). An appreciation for both haptic and visual stimuli is essential in order to enhance learning (Siwe, 2007).

Students use active haptic learning to touch and palpate organs from multiple positions to fully appreciate the size, shape, and texture of invisible objects (Siwe, 2007; Siwe et al., 2007; Shresthah, Wijma, Swahnberg, & Siwe, 2010). Siwe further stated that enclosing the uterus between the hands allows learners to move their hands and explore the size and shape of the uterus. This exploration leads to the formulation of a three-dimensional picture in the examiner's mind, which then represents the concept of the palpated object (Carter, 2010; Siwe, 2007; Siwe et al., 2007; Shresthah et al., 2010).

Conceptual Definitions

Bimanual examination. The bimanual examination is defined as the portion of a pelvic or examination in which the health care professional inserts two fingers into the vagina and places the other hand on the abdomen to palpate the cervix, uterus, and ovaries (McGraw-Hill, 2002).

Cervical cytologic specimen. A cervical cytologic specimen or Papanicolaou smear (Pap smear) is a specimen of exfoliated epithelium that is collected from the surface of the cervix by using a spatula and a brush (McGraw-Hill, 2002). This specimen is then placed onto a glass slide or into a fixative solution for transportation and evaluation at the lab (McGraw-Hill, 2002). Such specimens are used as a screening method for the detection of cervical cancer or any of its precursors (McGraw-Hill, 2003).

Speculum examination. A speculum examination is defined as an examination in which a provider uses an instrument to dilate a body cavity or passage in order to permit the examination of the internal structures (McGraw-Hill, 2002).

Standardized patient. A standardized patient (SP) is a patient who volunteers to allow physical assessment students to perform an examination on them in order to facilitate the learning process (Hardee & Kasper, 2005).

Operational Definitions

Technique #1 (bimanual examination first). The procedure for this technique was as follows (Carter et al., 2011):

1. The APRN student participants inspected and palpated the external genitalia and then performed a bimanual examination on a standardized patient.
2. The participants used no more than 1 cc of water-based lubricant and palpated the internal organs between two fingers inserted into the vagina while the opposing hand applied a gentle downward pressure on the lower abdomen.
3. The APRN student participants formed a visual image of the internal pelvic organs and assessed whether or not they were normal as evidenced by the organ's size,

shape, texture, and mobility and the presence or absence of tenderness of the structures.

4. The bimanual examination was followed by the speculum examination.

Technique #2 (speculum examination first). The procedure for this technique was as follows (Carter et al., 2011):

1. The APRN student participants inspected and palpated the external genitalia.
2. After inspection and palpation of the external genitalia, the APRN student participants inserted a vaginal speculum into the vagina and opened the speculum to visualize and assess the cervix and the vaginal walls.
3. The speculum examination was followed by the bimanual examination.

Cervical visualization. The *Ease of Cervical Visualization Questionnaire II* was used to measure the APRN student participants' perceptions of how difficult or easy cervical visualization was during the pelvic examination, which they performed during the advanced assessment pelvic skills lab.

Standardized patient. For the purposes of this research inquiry, standardized patients were utilized as patient models only. The standardized patients provided no teaching or guidance for the novice examiners participating in this study.

Ease of cervical visualization. The ease of cervical visualization score is defined as the perceived difficulty in the visualization of the cervix after the performance of a pelvic examination. Greater ease (less difficulty) is indicated with a lower score on the *Ease of Cervical Visualization Questionnaire II* and less ease (greater difficulty) is indicated with a higher score on the *Ease of Cervical Visualization Questionnaire II*.

Review of Literature

This literature review was conducted utilizing the following online databases: (a) Ebsco Host Medicine and Health Edition, which includes CINAHL Plus with Full Text, (b) Health Source: Nursing/Academic Edition, Medline, Medline with Full Text, and (c) SCOPUS, PUBMED. The following search terms were used for this literature review: pelvic examination, teaching pelvic examination, learning pelvic examination, speculum examination, bimanual examination, digital examination, lubricant, and haptic learning.

Information concerning changing the sequence of the pelvic examination to facilitate the visualization of the cervix was discussed only briefly within the literature. No published studies discussed studying differences between sequencing of the bimanual examination first compared to sequencing of or the speculum examination first and the ease of visualization of the cervix. Carter (2010) conducted a research study to compare ease of cervical visualization among APRN students who performed a bimanual examination first rather than after speculum examination first (traditional method). Performing bimanual first had a beneficial influence on cervix visualization. Results were analyzed using a t-test for independent samples that revealed a statistically significant difference in the ease of cervical visualization between the bimanual-first technique group (*Md*=2.79, SD=1.84, *n*=72) and the speculum-first technique group (*Md*=3.43, SD=2.30 *n*=145). Less manipulation of the vaginal specula was required to visualize the cervix (P=>.01).

The Pelvic Examination: Important Concepts

As described by Ryden (2002), the standard sequence for performing the female pelvic examination is: (a) inspection and palpation of the external genitalia, (b) speculum examination, and (c) bimanual examination. Previously, health care professionals assumed that vaginal

lubricants, which were used to increase patient comfort during insertion of the vaginal speculum and palpation of the cervix, would interfere with the interpretation of Pap smears and cervical cultures (King, Nicol, & Rodin, 1980). Several recent studies (Amies et al., 2002; Griffith et al., 2005; Harer, Valenzuela, & Lebo 2002; Hathaway, Pathak, & Maney, 2006; Tavernier, Connor, & Gates, 2003) have noted that water-based lubricants do not impact analyses or assessment of cervical cytologic specimens, human Papillomavirus (HPV) testing, and cervical cultures as also cited in Carter, Rad, Schwarz, Van Sell, & Marshall, 2011.

One common practice that clinicians use when the cervix is not promptly visualized, is to remove the speculum, palpate the cervix to determine its orientation within the vaginal vault, then reinsert and position the speculum (Aniyabudhiphongs, Bates, Brockmeyer, Catalanotti, & Weinstein, 2008; Carcio & Secor, 2010; Carter, 2010; Bates, Carroll, & Potter, 2011; Carter et al., 2011). In addition, experienced clinicians have proposed recently that performing the bimanual examination before the speculum examination facilitates the insertion of the speculum and provides cues to the examiners about any abnormalities that require further inspection (Braverman, Breech, & The Committee on Adolescence, 2010; Carcio & Secor, 2010).

Performing the bimanual examination before the speculum examination helps both novice and experienced clinicians determine the vaginal length and tone, the uterine position, and the location of the cervix (Braverman et al., 2010; Carcio & Secor, 2010). Palpating the cervix provides the clinician with tactile cues regarding the location and the plane of the cervix. An awareness of the anatomical landmarks helps clinicians determine the size and shape of the vaginal speculum to use during the examination (Braverman et al., 2010; Daley & Cromwell, 2002; Carcio & Secor, 2010; Carter, 2010; Lindheim, Sprague, & Winter, 2006). Therefore,

performing the bimanual examination prior to the speculum examination should facilitate cervical visualization and encourage the self-confidence of the novice examiner (Carter, 2010).

Lubrication during the Pelvic Examination

Previously, health care professionals assumed that vaginal lubricants, which were used to increase patient comfort during insertion of the vaginal speculum and palpation of the cervix, would interfere with the interpretation of Pap smears and cervical cultures (King, Nicol, & Rodin, 1980). However, several recent studies have reported that water-based lubricants do not impact the analysis or assessment of cervical cytologic specimens, human Papillomavirus (HPV) testing, and cervical cultures (Amies et al., 2002; Griffith et al., 2005; Harer, Valenzuela, & Lebo 2002; Hathaway, Pathak, & Maney, 2006; Tavernier, Connor, & Gates, 2003; Carter et al., 2011).

In a study of 8,534 young, reproductive age women, Amies et al. (2002) reported that the use of a small amount of water-soluble gel lubricant on the outer blades of the speculum did not change the cervical cytology results. Harer et al. (2002) reported that the lubrication of the vaginal introitus and the speculum with a water-based lubricant facilitated pelvic examination and had no adverse effect on Pap smear interpretation. In a 2003 study, Tavernier et al. reported that there was no statistically significant difference in the adequacy of the cytology between the uses of water, gel, or no lubricant. Griffith et al. (2005) reported study results that indicated that the use of a small amount of gel lubricant on a metal vaginal speculum did not increase unsatisfactory cytology in a sample of 3,460 women having Pap smear. In addition, Hathaway et al. (2006) reported that water-based lubricant does not affect liquid-based cervical cytology Pap testing in a group of 200 women who received two simultaneous Pap smears. Also, in a 2006 study involving 60 women, Gilson, Desai, Cardoza-Favarato, Vroman, and Thornton reported

that speculum gel does not affect cervical cytology during a traditional Pap smear and that it does not alter the discomfort the patient feels during the examination. Finally, Harmanli and Jones (2010) stated that there was level 1 evidence (several randomized controlled trials) that lubrication of the external surface of the speculum does not interfere with Pap smear results or the interpretation of culture specimens collected from the cervix. Harmanli and Jones proposed that lubrication of the external surface of the speculum should be implemented as standard practice.

Haptic Learning

J. J. Gibson first discussed the differences between passive and active touch in the literature in 1962. Gibson (1962) discussed that being passively touched focuses the observer on his or her body sensations and that active exploration tends to guide the observer's attention to his or her surroundings (and what is being examined). Haptic perception involves an active, manual exploration of an object (Lederman & Klatzky, 2009).

Recent considerations in the study of haptic perception have discussed the interaction between the "what" and "where" channels (Lederman & Klatzky, 2009). The "what" channel includes the haptic perception of objects and their properties, such as being able to feel the surface qualities of an object, the thermal quality, the weight, and the compliance of an object upon palpation (Lederman & Klatzky, 2009). The "where" channel includes the perceiver's perception of spatial layout and external space (Lederman & Klatzky, 2009). This perception of spatial layout can be subject to distortion dependent on the nature of the exploration (Lederman & Klatzky, 2009). For example, distortion can be caused by the frame of reference that the perceiver uses to appreciate the object such as the distance from a table top versus the distance from a lamp (Shimono, Higashiyama, & Tam, 2001). Therefore, differences in the spatial

properties of objects as well as the perception of their special layout within the environment are important to consider.

Siwe (2007) describes the haptic experience as a combination of tactile perception and kinesthetic perception to convey information by "active touch." When actively engaging in the perception of an object, previous visual experiences and characteristics about the object are combined to give an overall impression of the object (Siwe, 2007). As an object is explored, the perceptive and motor tasks are highly linked to elicit the desired information (Flanigan & Lederman, 2001). The properties of an object such as texture, elasticity, compliance, and temperature are conveyed more accurately by touch (Flanagan & Lederman, 2001). Visualization of an object is more effective and more rapid than palpation when determining the concept of shape (Lederman & Klatzky, 2009). A combination of haptics and vision together are more effective for many learning experiences (Siwe, 2007).

Siwe (2007) described haptic learning as active touch and described how a student moves their hands during the exploration of an object as well as the decision to actively explore the object. This type of object exploration facilitates the learning process and motivates the learner to facilitate the exploration process, especially during the performance of the pelvic examination (Siwe, 2007). As students perform the pelvic examination, they use active touch as they palpate the internal pelvic organs and differentiate between normal and abnormal findings (Siwe, 2007). Siwe (2007) stated that the bimanual examination creates, for the examiner, a three dimensional mental image of the internal organs from which the student can describe what was felt.

The interaction between vision and touch and whether this interaction may lead to an input channel for subsequent visual processing is still being debated within the literature (Lederman & Klatzky, 2009). It is unclear what the nature of the visual processing of tactile

inputs is and how this leads to visual processing (Lederman & Klatzky, 2009). This visual involvement could include knowledge directed pathways (anticipatory visual imagery/visual memory) that may assist in tactile performance (Lacey, Campbell, & Sathian, 2007). Lederman and Klatzky (2009) further assert that the goal of the field of study of haptics is to develop effective tactile, haptic, and multisensory interfaces for use within our world including games, minimally invasive surgery, graphic displays for the blind, and multisensory guidance for novice surgeons.

In 2007, Sewell, Blevins, Peddamatham, and Tan completed a pilot study that examined residents given haptic training for surgical drilling skill and whether it improved surgical technique of the same skill. The findings of Sewell et al.'s pilot study suggested that students who had haptic training demonstrated improved learning. Haptic feedback was also shown to enhance the performance of surgical simulator training in a group of surgical residents when introduced early in the training of an image guided skill when compared to those who have not received the haptic feedback (Strom, et al., 2006)

Haptic training has not been studied in areas concerning learning the pelvic examination. Although research in the area of medicine and haptic training is limited, ongoing research will determine which instructional methods and learning environments best enhance student learning.

Learning the Pelvic Examination

Learning the pelvic examination can be a challenging and stressful experience for students (Shresthah et al., 2010). The traditional method of teaching the pelvic examination includes didactic teaching with the student performing an exam on an actual gynecology patient under the guidance of an experienced clinician (Siwe, 2007). This method does not provide a sufficient amount of time for novice examiners to adequately familiarize themselves with the

examination process and to develop procedural and communication skills essential for optimal examination (Siwe, 2007). Today, professional patients or standardized patients are widely utilized to teach pelvic examination techniques to novice examiners. In addition, multiple strategies have been utilized to teach the pelvic examination such as didactic lectures, video tutorials, pelvic models (with and without digital feedback), preceptor guidance with pelvic examination (Aniyabudhiphongs et al., 2008; Siwe, 2007; Theroux & Pearce, 2006), and the pelvic examination of patients when they are under anesthesia (Ubel, Jepson, & Silver-Isenstadt, 2003).

Various teaching programs have been developed to assist the learning process among novice clinicians. These programs strive to teach students the technical skills of speculum and bimanual examination, as well as excellent communication skills (Fairbank, 2009; Siwe, 2007). Effective teaching using clinical teaching associates (standardized patients) affords students constructive feedback from a patient's perspective, an uncommon occurrence in clinical practice (Fairbank, 2009). An evaluation of this teaching program found that student participation greatly increased the levels of student self-assessed abilities in performing pelvic examination techniques (Fairbank, 2009).

Herbers, Wessel, El-Bayoumi, Hassan, and Onge (2003) evaluated the effectiveness of a pelvic examination training program for internal medicine interns. The interns were randomized into two groups (Herbers et al., 2003). The participants in one group received eight hours of training with a trained standardized patient and written instruction while the participants in the second group received written instruction only (Herbers et al., 2003). Each participant completed questionnaires designed to measure their level of knowledge regarding the pelvic examination before and after receiving their training (Herbers et al., 2003). Herbers et al.

reported that both groups had large differences in skills present at the baseline. Graduates from the United States scored much higher than non-U.S. graduates (Herbers et al., 2003). In addition, the interns who received training with standardized patients scored significantly higher regarding their knowledge about the pelvic examination at follow-up than the interns in the control group did (Herbers et al., 2003).

Mannequin-based simulation has also been utilized to teach pelvic examination techniques (Pugh et al., 2007). In a recent study, Pugh et al. (2007) reported that the fear of causing harm was the top cause of student anxiety when learning to perform a pelvic examination. The findings in this study reported that students progressed from feeling "very uncomfortable" to "somewhat comfortable" after participating in mannequin-based simulation training modules (Pugh et al., 2007). The authors suggested that pelvic examination teaching methods using mannequin-based simulation should be implemented prior to allowing students to gain experience with pelvic examination teaching associates (Pugh et al., 2007).

Pugh et al. (2001) used a mechanical simulator to assess the pelvic examination skills of experienced clinicians and medical students using the e-Pelvis simulator. Pugh et al. suggested that the objective assessment of clinical skills is challenging to measure. The experienced clinicians were much more accurate with their pelvic examination technique than the medical students and the experienced clinicians also performed more rapid assessment of the e-Pelvis than the medical students (Pugh et al., 2001). Pugh et al. concluded that the use of the e-Pelvis to measure skill level after clinical experiences could enhance the learning process for both medical students and experienced clinicians.

In 2010, Hassinger et al. discussed a pilot study for a virtual pelvic anatomy simulator that was used to educate a group of medical students and surgical residents. Computer based

educational training complemented learning strategies for clinicians and provided access to educational material (Hassinger et al., 2010). Although haptic perception has not yet been integrated in this virtual pelvic anatomy simulator, changes in technology could lead to a greater learning experience.

A recent study compared the instructiveness of real patients versus simulated patients in undergraduate medical education (Bokken et al., 2010). The aim of this study was to evaluate which instructional methods were the most instructive from the perspective of the students (Bokken et al., 2010). Although the students learned from both standardized and clinical patients, the students felt that the clinical patients were more realistic (Bokken et al., 2010). Siwe et al. (2007) also compared outcomes in terms of skills between professional patients and clinical patient models. Siwe et al. reported that the medical students who learned with a professional patient model were less distressed and more skillful at pelvic examination compared with those who learned with a clinical patient model. The students who learned with a professional patient were also certain that they palpated the uterus and at least one ovary (Siwe et al., 2007). The benefit of performance with a professional patient is the opportunity for students to learn in a relaxed and interactive setting that promotes student confidence and personal ability to perform the pelvic examination (Siwe et al., 2007).

Theroux and Pearce (2006) explored students' perceptions of their experiences with learning the pelvic examination comparing standardized patients and volunteer peer examination. The students rated their experiences with standardized patients more highly than those with volunteer peer examinations and reported a better understanding of pelvic examination techniques than their peers who performed peer pelvic examination (Theroux & Pearce, 2007).

The benefit of using clinical teaching associates or standardized patients has been well reported in the literature. Higham, Nestel, Lupton, & Kneebone, (2007) evaluated an innovative curriculum that involved a teaching and learning environment with hybrid simulation. During this interaction, the students performed a pelvic examination using a pelvic simulator while interacting verbally with a standardized patient who was sitting near the head of the examination table (Higham et al., 2007). This type of hybrid simulation learning experience integrated different clinical situations and scenarios within the context of the pelvic examination instruction and the students valued the opportunity to participate (Higham et al., 2007). As part of the learning process, the standardized patients, the moderators, the clinical experts, and the students met and discussed different approaches to clinical challenges and this provided a valuable learning experience for all involved (Higham et al., 2007).

Gaps in the Literature

The amount of literature that was available on alternatives to sequence of the pelvic examination was sparse. Only one unpublished manuscript was available. Evidence regarding alternatives to traditional techniques (speculum examination prior to bimanual examination) has not been reported. Therefore, contributions to the body of literature on this topic are needed. In addition, due to recent changes in the recommendations regarding the use of lubricants with speculum examination, additional research regarding the sequence of the pelvic examination is warranted.

Instrumentation

The instrument that was used to collect the data for this study was the *Ease of Cervical Visualization Questionnaire II* (Appendix A). This survey was adapted from its previous form

after receiving permission from Dr. Sherry Carter, the original author (see Appendix B). No previously published studies have reported using this tool.

The survey contains a 10-point visual analog scale. This scale enabled the APRN student participants to give a subjective measure of personal perception of the ease of cervical visualization. Higher scores of the Ease of Cervical Visualization Questionnaire indicated increased difficulty in visualization.

The face validity of the questionnaire was established by a Women's Health Nurse Practitioner (WHNP), a Texas Women's University Associate Professor of Nursing, and a university Professor Emeriti (the author of *Nursing Research* (2007)). The construct validity regarding the tool was not indicated.

Population and Sample

A convenience sample was obtained from the APRN graduate nursing students at a College of Nursing in the Southwestern United States during the Fall 2010 semester. The criterion for inclusion in the study was APRN students who were registered nurses enrolled in an Advanced Assessment and Differential Diagnosis course during the Fall 2010 semester. The only exclusion criterion for this study was an APRN student who declined to participate.

Cohen (1992) established the parameters for a power analysis of tests like the *t* test to determine differences between two independent means. Cohen indicated that to determine the difference between independent means for the *t* test with a power of 80% and alpha of .05, a large effect size can be detected by using 26 subjects per group. A study by Carter (2010) reported that a visual ease (ease of viewing cervix) score yielded a statistically significant effect size of .28 between two groups of students: (a) a group of three bimanual-first students and (b) a group of six speculum-first students. Carter's 2010 study lends support that the small sample

size in this study could yield statistically significant results. Although initial power analysis indicated that a sample size of 26 subjects per group was needed, the available sample size would serve as a pilot study, which could also serve to determine future effect size for this intervention.

In consideration of the chance that an initial data analysis could indicate that the assumptions of normal distribution or homogeneity of variance could be violated for the *t* test, the Mann-Whitney U test, a nonparametric test for two independent groups, would be substituted for the t-test (Pallant, 2007). Assistance from the university faculty aided the evaluation of the data, the interpretation, and the presentation of the results.

Implementation

The objective for this project was to measure and compare the ease of cervical visualization as measured by two groups of APRN students doing pelvic examinations with different participants in each group. One group performed the bimanual examination (Technique #1) prior to the speculum examination and the second group performed the speculum examination prior to the bimanual examination (Technique #2). A comparison of the results between the two groups was used to evaluate the sequence of the examination within the pelvic examination and the ease of cervical visualization.

The timeline for the project is outlined in Appendix A. Following the completion of the initial clinical inquiry proposal and the receipt of capstone approval from university faculty, an Institutional Review Board (IRB) application for an exempt study was submitted. Approval from the University IRB was subsequently obtained in October 2010.

The study materials and methods were placed on a university class website for student review one week prior to an advanced assessment skills lab. On the day of the skills assessment,

the students were provided with both written instructions and enrollment instructions and they were also given a computer-slide presentation over both pelvic examination techniques. In addition, the students were given the opportunity to ask questions prior to agreeing to participate in the study. The students were then enrolled in the study and participated in the study. The data was collected on November 8, 2010, during the pelvic exam skills lab.

The statistical and data evaluation took place in December 2010 and January 2011. The months of February, March, and April 2011 were allotted for authoring the capstone presentation, preparing the presentation of findings, and submitting the article for publication.

The project requirements for this clinical inquiry project were fulfilled by utilizing current educational resources. No additional funding or resources were needed from the university. This project included the collection of the information included in the *Ease of Cervical Visualization Questionnaire II*. The questionnaire was distributed to each participant on the day of the skills lab for Advanced Assessment. This project was supervised by the university faculty members who were teaching Advanced Assessment.

Since standardized patients were already used as part of the lab curriculum for the skills lab, additional support staff was not required. However, the standardized patients did not provide their usual guidance to novice examiners but were used as patient models only.

The information that was collected was included in the *Ease of Cervical Visualization Questionnaire II* (See Appendix B). The questionnaire included data regarding the type of pelvic examination performed (bimanual prior to speculum versus standard technique). Each participant identified which type of examination performed and rated the ease of cervical visualization. The type tract of each APRN student (Family Health, Adult Health, Women's Health, or Child Health) was listed in order to elicit possible differences in the ease of

visualization among different tracts of students. Information was also collected regarding the amount and the type of the participants' previous pelvic examination experience since, with experience, the pelvic examination could become easier to perform. The participants' perception regarding the ease of cervical visualization was measured on a 10-point visual analog scale in order to indicate the similarities and differences among APRN students.

The resources that were utilized for this study included the support and supervision of the project by university faculty members. The pelvic examination skills lab utilized standardized patients as a part of the normal curriculum and changes to this process were not needed in order to facilitate this study.

The study was approved by the university's IRB. A copy of the approval letter is included in Appendix D. Appendix B contains the list of the university faculty members who approved this clinical inquiry project and the use of the Ease of Cervical Visualization II scale.

Research Procedures

This clinical inquiry began with the DNP student investigator submitting the study protocol, the instructions for participation, and the techniques as well as computer-handouts presentations to a university class website for advanced assessment one week prior to the advanced assessment skills lab. The students received instruction regarding the basic pelvic examination techniques by the faculty of the advanced assessment class (Appendixes F & G). Each student was instructed on both techniques. Each student then practiced the two techniques on mannequins at eight separate stations around the room. Instructors or senior women's health nurse practitioner students in their preceptorship monitored and assisted the students with their performance of the pelvic examination technique at the stations. Thus, the students were able to

practice performing the exam several times while obtaining feedback and instruction from instructors regarding the pelvic examination technique.

At the beginning of the APRN advanced assessment student skills lab, the students were informed about the study protocol and were asked to participate in the study. Each standardized patient volunteer completed a form that gathered selected demographic information consisting of age, height, weight, number of vaginal deliveries, and number of cesarean sections. The standardized patients also signed a Training Participation Consent (standard form for all standardized patients participating in pelvic exam skills lab) form provided by the university which described the expectations of the students, the expectations of the standardized patients, and the exact procedures that would be included within the process of participation. Each standardized patient was assigned a code between A and H. Each code (standardized patient) received an equivalent number of each type of examination. Finally, the standardized patients were informed as to their role within the study.

After agreeing to participate in the study, student participants randomly chose a sealed envelope that contained a letter assigning them to a specific standardized patient (A-H) and examination technique (bimanual vs. speculum first). Each envelope was numbered from 1-38, and this number was also the identification number that was placed in the open-source, interactive web-based survey, containing the Ease of Cervical Visualization II Questionnaire.

Study participants performed an examination on the standardized patient assigned, utilizing the assigned examination technique. Each student was accompanied by a faculty or a senior WHNP student. Immediately after completion of the pelvic examination, before leaving the skills examination area, study participants completed an open-source, interactive, web-based survey (LimeSurvey®), which was a digital survey containing the items on the *Ease of Cervical*

Visualization Questionnaire II. Responses to the survey were anonymous. Results were saved in a database and transferred to the Statistical Package for Social Sciences (SPSS) version 18.0 Grad Pack Edition for analysis. Each participant completed one examination and one survey. The participants were allowed to leave upon submission of a completed survey.

Plan for Evaluation.

During planning for the project the anticipated statistical evaluation that was to be completed was the t-test for independent samples. Although the sample sizes of the groups were small, t-tests can be completed in small samples if the data is evenly distributed. After initial evaluation, the data showed that it was not evenly distributed and that the sample sizes were too small to yield statistically significant differences among groups. Because of the unequal distribution of the data, a Mann-Whitney U test was completed using the SPSS program. The Mann-Whitney U test is a non-parametric test used to detect the differences between two groups when the sample sizes or the distribution is unequal among groups (Pallant, 2007).

Due to the small sample size of the two comparison groups (bimanual-first and speculum-first), further analysis of demographic information was reported to provide further information regarding trends, such as the percentages within each group of the different types of participants, gender, or prior pelvic examination experiences. These percentages will enhance future research study designs and evaluation among groups of APRN students with different levels of expertise and allow for more specific training for these learners. Although the sample size was small for the two groups, the information to add to current research on pelvic examination procedures would suggest that an increase in the difficulty in performing the pelvic examination would correspond with an increase in the number of times the speculum was repositioned.

Outcome Results

The demographic data were analyzed using frequencies and descriptive statistics. The nominal data included the type of technique (bimanual/speculum first), the type of APN student, and information on the standardized patient (height, weight, BMI, parity, history of cesarean section or vaginal delivery. The number of speculum positionings and the visual analog scale for measuring the ease of cervical visualization were considered to be quasi-interval level data.

After the collection of the data and the checking for errors within the data was completed, the statistical evaluation of the ease of cervical visualization was evaluated. The data was entered into SPSS and a Shapiro-Wilk was completed. Shapiro-Wilk is a statistical test that allows evaluation of the distribution of the results (either normally distributed or not normally distributed) (Pallant, 2007). The test results indicated a Shapiro-Wilk value of .266 which was not statistically significant for the group who performed the bimanual examination before the speculum examination. This value indicated that this data were normally distributed. A Shapiro-Wilk was also completed on the speculum examination before the bimanual examination and this data showed a statistically significant result of .023 which indicated that the data were not normally distributed. Because the data were not normally distributed, a t-test of independent samples was not a valid alternative for the evaluation of results.

A Mann Whitney-U test was then completed on the data. This non-parametric statistical analysis does not require normal distribution of data (Pallant, 2007). The Mann Whitney-U test revealed no statistically significant difference in the ease of cervical visualization between the bimanual-first technique group (Md=4.0, n=17) and the speculum-first technique group (Md-3.5, n=20), U=150, z=-0.615, p=.539, r=.101 [r = effect size]. These indicate that there is no

statistically significant difference in the ease of cervical visualization between the groups since Cohen (1988) reports effect size as .1 small, .3 medium, and .5 large.

Due to limited sample size this project is similar to a pilot study. Pilot studies have value in that 20-30 cases or subjects are generally sufficient to estimate the sample needed for the actual study and they are also useful for working out design issues (Lenth, 2011). Future research regarding this type of project needs to be adequate in sample size and control for possible confounding variables. .

Exploration of post priori power analysis for the current study (0.17) and for Dr. Carter's study (.669) was conducted using Power Precision software (Borenstein, Rothstein, & Cohen, 2010). Although the group mean differences between the bimanual-first technique group and the speculum-first technique group were similar between the two studies, -.66 and -.65, respectively, the standard deviation in the current study was larger, 2.83 (n = 37) and 2.16 (n = 217), respectively, which partially contributed to the lower calculated power of .17 for the current study. For anticipated future study the sample size was estimated for an effect size of .4, alpha of .05, standard deviation of 1.0 and power of .80. For these parameters 78 subjects would be needed in each of these two groups.

Additional Findings

The number of times the speculum was repositioned positively correlated with the perceived difficulty of cervix visualization (*rho*= .56, p = 01, n = 20). A Spearman rho correlation coefficient is non-parametric statistical test that is designed to evaluate correlations among the variables (Pallant, 2007). The post priori power analysis was .815. Figure 1 graphically illustrates the comparison between the two study groups regarding the relationship between numbers of speculum repositionings and the perceived difficulty of visualizing the

cervix. For the speculum-first technique group, note the sharp increase in the perceived difficulty in the cervix visualization when the speculum was repositioned three and four times. This contrasts with a gradual increase for the bimanual first group.

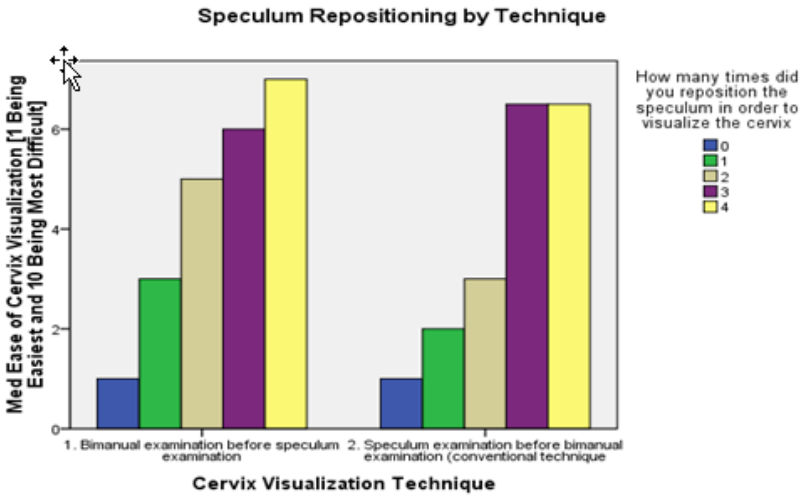


Figure 1. Speculum repositioning by technique by ease of cervix visualization.

As illustrated in Table 1, a Spearman rho coefficient was then calculated and interpreted which indicated a statistically significant negative correlation between the ease of cervix visualization and the height of the patient. This indicates that, as the height of a standardized patient decreases, the number of times the speculum had been repositioned increases. This finding is not consistent with the literature, which indicates that it is more challenging to visualize the cervix in patients who have a larger body mass index (BMI) than in those who have smaller BMI measurements (Ferrante, Piasecki, Ohman-Stricland, & Crabtree, 2009) .

Other characteristics of the standardized patients did not indicate any differences in the ease of cervix visualization among the groups when comparisons were completed on the ages of the standardized patients. As the parity of the standardized patients increased, so did the students' perceptions of the difficulty of visualization of the cervix (see Figure 2).

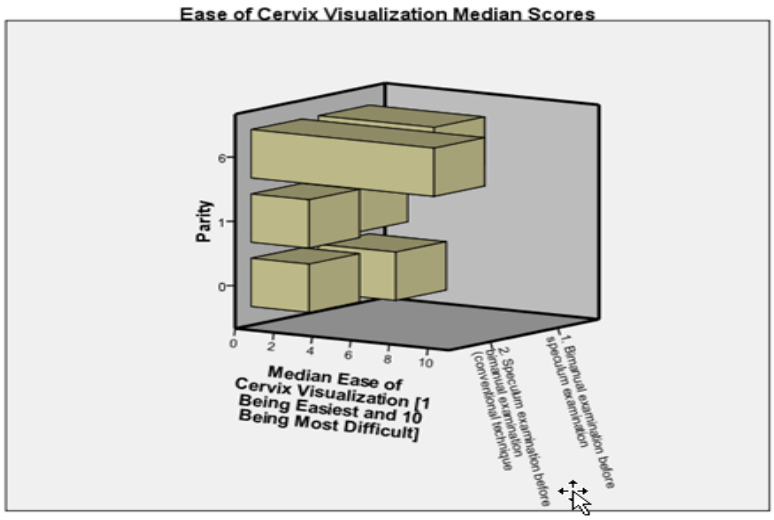


Figure 2. The perception regarding the difficulty of the visualization of the cervix based on the parity of the standardized patients.

Table 1

Correlation Matrix of Key Variables

			Height	Weight	Times repositioned*	Ease of Cervix Visualization***
Spearman's rho	Height	Correlation Coefficient	1.000			
		Sig. (2-tailed)				
		N	37			
	Weight	Correlation Coefficient	.770**	1.000		
		Sig. (2-tailed)	.000			
		N	37	37		
	Times repositioned*	Correlation Coefficient	-.519**	-.362*	1.000	
		Sig. (2-tailed)	.001	.028		
		N	37	37	37	
	Ease of Cervix Visualization ***	Correlation Coefficient	-.099	.040	.483**	1.000
		Sig. (2-tailed)	.558	.815	.002	
		N	37	37	37	37

Note. * = How many times did you reposition the speculum in order to visualize the cervix? ** = Correlation is significant at the 0.01 level (2-tailed). * = Correlation is significant at the 0.05 level (2-tailed). *** = [1 Being Easiest and 10 Being Most Difficult]

The Adult Health nurse practitioner students reported an increased median score regarding the ease of the visualization of the cervix scores when compared to Child Health, Women's Health, or Family Health nurse practitioner students (see Figure 3). This finding suggests that further learning opportunities and additional experience completing the pelvic examination should be discussed and demonstrated to ensure a proper technique prior to the pelvic examination skills lab and throughout a student's clinical experiences.

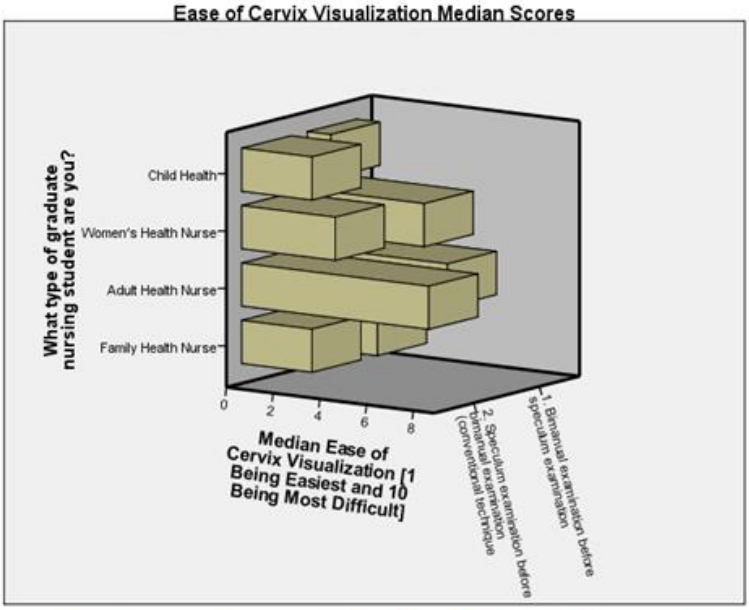


Figure 3. The perception regarding the difficulty of the visualization of the cervix based on the type of student.

One of the standardized patients (standard model patient E) did, however, yield a higher score in cervical visualization among both types of procedures (see Figure 4). Given that the same instructor was assigned to each standard model patient, the instructor for this group may have been a confounding variable in the ease of cervical visualization scores noted for this standardized patient group. In fact, the researcher's observation of the students in this particular

instructor group indicated signs of stress and anxiety such as nervousness and crying.

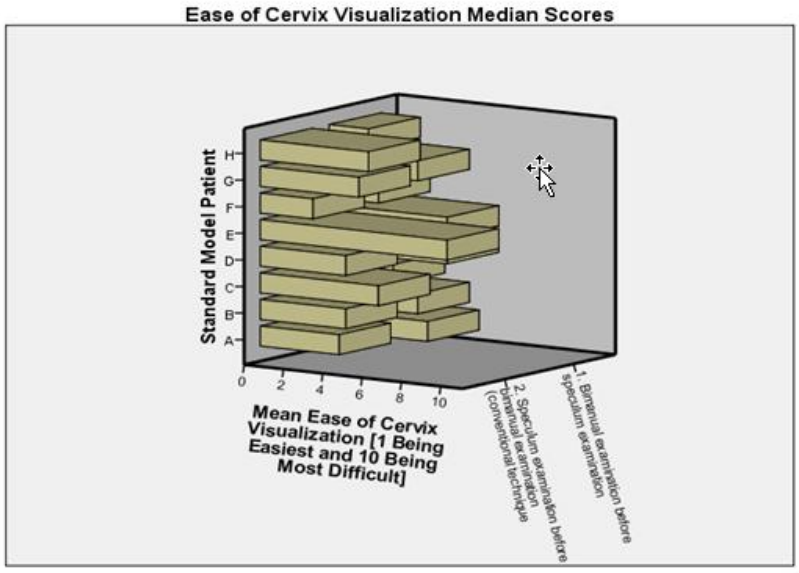


Figure 4. The mean ease of the cervix visualization scores by standard model patient and by technique.

Limitations

The first limitation to this study was the number of students (37) who participated. Given this limitation, this study is comparable to a pilot study, which is useful for estimating the sample needed for the actual study and for working out potential design issues (Lentz, 2011). A post priori power analysis indicated that, the sample size estimated for an effect size of .4 (difference between means), alpha of .05, standard deviation of 1.0 and a power of .80. For these parameters 78 subjects would be needed in each group. This emphasized the impact of variance within groups on statistical significance, even for nonparametric statistical tests, and the subsequent need to stringently control for potential study design issues.

In this pilot study, an observation related to the instructor-student dyad was made suggested that the stress and anxiety of the students may have an impact of ease of cervix visualization scores, along with teaching style of the instructor. Students reported that anxiety during this learning process was reduced when students and instructors were unhurried and in a

supportive environment (Abraham, Chapman, Taylor, McBride, & Boyd, 2003). This may have been a factor in the high standard deviation of mean ease of cervix visualization scores as evidenced by Figure 4. Thus, with this potential confounding variable controlled, future studies may require fewer participants to yield statistically significant results.

Recommendations

Previous findings (Carter, 2010) suggested that a statistically significant difference exists regarding the ease of visualization between those who perform the bimanual examination first and those who perform the speculum first examination. Due to the small sample size and lack of normal distribution of the samples, these findings were not replicated within this study. Further studies might consider:

1. Using larger groups of standardized patients and larger numbers of students could show a statistically significant improvement in the ease of cervical visualization.
2. Including an assessment of the student stress-anxiety level in the study might help to control for this potential confounding variable in the ease of cervix visualization scores.
3. Changing the student-instructor dyad so that one given instructor's approach would have less impact on the students and their associated mean ease of cervix visualization score.

Additional studies of pelvic examination techniques and teaching procedure to novice clinicians would add to the body of knowledge in women's health examination and corresponding instructional technologies. Implications range from increasing student confidence in performance of the pelvic examination, identifying evidenced based effective teaching

methodologies for gynecological care, and increasing women's compliance with gynecological health care recommendations.

End Products

After careful analysis of this project several important concepts were discovered. A post-hoc analysis revealed adequate sample size for further research should be around 78 participants to elicit statistically significant results. Possible confounding variables such as student anxiety and student-instructor dyad were observed, anecdotally. . Considerations for further research could include measurement of student anxiety prior to and after pelvic examination as well as rotation of instructor from standardized patient to standardized patient. The end products for this project included facilitating simple but creative techniques to promote the student ability to perform the pelvic examination. By enhancing APRN student examination skills, students have more confidence in their ability to locate the cervix in a clinical setting, which will potentially ease cervical visualization, increase patient comfort during the examination.

Conclusions

Although there was not a statistically significant difference regarding the ease of visualization of the cervix when different examination sequences were utilized, this project serves to enhance the body of knowledge regarding the pelvic examination techniques. Although many experienced clinicians usually do not utilize cervical palpation prior to the speculum examination, this simple revision in technique is an important clinical pearl to utilize when problems and technical difficulties arise during the cervical visualization. Differences in technique are also an important teaching tool for novice examiners and can assist in learning a difficult or challenging procedure.

The plans for dissemination of this research include the submission of an article for publication in several academic journals that also consider innovative and creative teaching techniques for academia. The results of this study will also be presented at a poster presentation for Texas Woman's University Research & Creative Arts Symposium held on April 13, 2011 at Texas Woman's University. A podium and poster presentation of the results will also be given during the Doctor of Nursing Practice DNP Celebration Day on April 29, 2011.

References

Abraham, S., Chapman, M., Taylor, A., McBride, A., & Boyd, C. (2003). Anxiety and feelings of medical students conducting their first gynecological examination. *Journal of Psycosomatic Obstetrics and Gynecology*, *24*(1), 39-44.

Amies, A., Miller, L., Lee, S., & Koutsky, L. (2002). The effect of vaginal speculum lubrication on the rate of unsatisfactory cervical cytology diagnosis. *Obstetrics & Gynecology*, *100*(5), 889-892.

Aniyabudhiphongs, K., Bates, C., Brockmeyer, D., Catalanotti, J., & Weinstein, A. (2008, April 10). *Teaching the pelvic exam: A patient-centered and evidence-based approach to training medical residents*. Retrieved from http://www.sgim.org/userfiles/file/AMHandouts/AM08/WC10%20KimAriyabuddhiphongs.pdf

Bates, C. K., Carroll, N., & Potter, J. (2011). The challenging pelvic examination. *Journal of General Internal Medicine*. Article in press. 1-7. doi:10.1007/s11606-010-1680-8

Bokken, L., Rethans, J., Jobsis, Q., Duvivier, R., Scherpbier, A., & van der Vieuten, C. (2010). Instructiveness of real patients and simulated patients in undergraduate medical education: A randomized experiment. *Academic Medicine*, *85*(1), 148-154.

Borenstein, M., Rothstein, H., & Cohen, J. (2010). *Power and precision (Version 4).* Available from http://www.power-analysis.com

Braverman, P., Breech, L., & The Committee on Adolescence. (2010). Gynecologic examination for adolescents in the pediatric office setting. *Pediatrics*, *126*(3), 583-590.

Carcio, H., & Secor, M. (2010). *Advanced health assessment of women: Clinical skills and procedures* (2nd ed.). New York: Springer.

Carr, S., & Carmody, D. (2004). Outcomes of teaching medical students core skills in women's health: The pelvic examination program. *American Journal of Obstetrics and Gynecology, 190,* 1382-1387.

Carter, S. (2010). *The pelvic examination and cervix visualization: Does sequence matter?* Poster session presented at the Sigma Theta Tau Eighteenth National Nursing Research Conference. Dallas, Texas, 75235

Carter, S., Rad, R., Schwarz, B., Van Sell, S., & Marshall, D. (2011). *Creating a more positive experience of pelvic examination*. Manuscript submitted for publication.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Daley, A. M., & Cromwell, P. F. (2002). How to perform a pelvic exam for the sexually active adolescent. *The Nurse Practitioner, 27*(9), 28-34.

Dull, P., & Haines, D. J. (2003). Methods for teaching physical examination skills to medical students. *Medical Student Education, 35*(5), 343-348.

Fairbank, C. (2009). Effective teaching of pelvic examination. *The Clinical Teacher, 6*, 101-104.

Ferrante, J. M., Piasecki, A. K., Ohman-Stricland, P. A., & Crabtree, B. F. (2009). Family physician's practices and attitudes regarding care of extremely obese patients. *Obesity, 17*(9), 1710-1716.

Flannigan, J., & Lederman, S. (2001). Neurobiology: Feeling bumps and holes. *Nature, 412*(6845), 389-381.

Gentaz, E., Baud-Bovy, G., & Luyat, M. (2008). The haptic perception of spatial orientations. *Experimental Brain Research, 87*, 331-348.

Gibson, J. J. (1962). Observations on active touch. *Psychological Review, 69*, 477-491.

Gilson, M., Desai, A., Cardoza-Favarato, G., Vroman, P., & Thornton, J. A. (2006). Does gel affect cytology comfort in the screening Papanicolaou smear? *The Journal of the American Board of Family Medicine, 19*, 340-344.

Griffith, W., Stuart, G., Gluck, K., & Heartwell, S. (2005). Vaginal speculum lubrication and its effects on cervical cytology and microbiology. *Contraception, 72*, 60-64.

Hardee, J. T., & Kasper, I. K. (2005). From standardized patient to care actor: Evolution of a teaching methodology. *The Permanente Journal*, *9*(3), 79.

Harer, W., Valenzuela, G., & Lebo, D. (2002). Lubrication of the vaginal introitus and speculum does not affect Papanicolaou smears. *Obstetrics & Gynecology*, *100*(5). 887-888.

Harmanli, O., & Jones, K. (2010). Using lubricant for speculum insertion. *Obstetrics & Gynecology, 116*(2), 415-417.

Hassinger, J. P., Dozois, E. J., Holubar, S. D., Camp, J. C., Farley, D. R., Fidler, J. F., & Larson, D. W. (2010). Virtual pelvic anatomy simulator: A pilot study of usability and perceived effectiveness. *Journal of Surgical Research*, *161*, 23-27.

Hathaway, J., Pathak, P., & Maney, R. (2006). Is liquid-based Pap testing affected by water-based lubricant? [Abstract]. *Obstetrics & Gynecology*, *107*(1), 66-70.

Heath, C., & Sulik, S. (2010). *Primary care procedures in women's health*. New York, NY: Springer.

Hendrickx, K., De Winter, B., Wyndaele, J., Tjalama, W., Debaene, L., Belleslags, B., & Bossaert, L. (2005). Intimate examination teaching with volunteers: Implementation and assessment at the University of Antwerp. *Patient Education and Counseling*, *63*, 47-54.

Herbers, J. E., Wessel, L., El-Bayoumi, J., Hassan, S., & Onge, J. E. (2003). Pelvic examination training for interns: A randomized controlled trial. *Academic Medicine,* 1164-1166.

Higham, J., Nestel, D., Lupton, M., & Kneebone, R. (2007). Teaching and learning gynaecology examination with hybrid simulation. *The Clinical Teacher*, *4*(4), 238-243.

King, A., Nicol, C., & Rodin, P. (1980). *Venereal diseases* (4th ed.). London, England: Bailliere-Tindall.

Lacey, S., Campbell, C., & Sathian, K. (2007). Vision and touch: Multiple or multisensory representations of objects. *Perception*, *36*, 1513-1521.

Lederman, S. J., & Klatzky, R. L. (2009). Haptic perception: A tutorial. *Attention, Perception, & Psychophysics*, *71*(7), 1439-1459.

Lenth, R. V. (2009). *Java applets for power and sample size (computer software)*. Retrieved from http://www.stat.uiowa.edu/~rlenth/Power.

Levi, A. (2008). Examining ourselves: Exploring assumptions about teaching pelvic examinations in midwifery education. *Journal of Midwifery and Women's Health*, *53*(5), 403-405.

Lindheim, S., Sprague, C., & Winter, T. (2006). Hysterosalpingography and sonohysterography: Lessons in technique. *American Journal of Radiology*, *186*, 24-29.

McGraw-Hill Concise Dictionary of Modern Medicine (2002). New York, NY: McGraw-Hill.

Pallant, J. (2007). *SPSS survival manual* (3rd ed.). New York, NY: McGraw-Hill.

Pugh, C., Heinrichs, W., Dev, P., Srivastava, S., & Krummel, T. (2001). Use of mechanical stimulator to assess pelvic examination skills. *Journal of the American Medical Association*, *286*(9), 1021-1023.

Pugh, C., Obadina, E., & Aidoo, K. (2007). Fear of causing harm: Use of mannequin-based simulation to decrease student anxiety prior to interacting with female teaching associates [Abstract]. *Teaching and Learning in Medicine*, *21*(2), 116-120.

Ryden, J. (2002). The gynecologic examination. In *Practical gynecology: A guide for primary care physicians* (p. 13). Philadelphia, PA: American College of Physicians.

Sewell, C., Blevins, N. H., Peddamatham, S., Tan, H. Z., Morris, D., & Salisbury, K. (2007). *The effect of virtual haptic training on real surgical drilling proficiency*. 2007 World Haptics Conference Proceedings. Retrieved from http://www.techhouse.org/~dmorris/publications/eggshell.pdf

Shimono, K., Higashiyama, A., & Tam, W. J. (2001). Location of the egocenter in kinesthetic space. *Journal of Experimental Psycology: Human Perception and Psychophysics*, (27)4, 848-861.

Shresthah, S, Wijma, B., Swahnberg, K., & Siwe, K. (Jan-Mar 2010). Learning pelvic examination with professional patients. *Journal of the Nepal Medical Association*, *49*(1), 68-75.

Siwe, K. (2007). *Learning the pelvic examination*. Linkoping, Sweden: Linkoping University.

Siwe, K., Wijma, K., Stjernquist, M., & Wijma, B. (2007). Medical students learning the pelvic examination: Comparison in terms of skills between a professional patient and clinical patient model. *Patient education and counseling*, *68*, 211-217.

Strom, P., Hedman, L., Sarna, L., Kjellin, K., Wredmark, T., & Fellander-Tsai, L. (2006). Early exposure to haptic feedback enhances performance surgical simulator training: A prospective randomized crossover study in surgical residents. *Surgical Endoscopy*, *20*, 1383-1386.

Tavernier, L., Connor, P., & Gates, D. (2003). Water versus gel lubricant for cervical cytology specimens. *Journal of Family Practice*, *52*(9), 701-704.

Theroux, R. & Pearce, C. (2006). Graduate student's experiences with standardized patients as adjuncts for teaching pelvic examinations. *Journal of the American Academy of Nurse Practitioners*, *18*, 429-435.

Ubel, P. A., Jepson, C., & Silver-Isenstadt. (2003). Don't ask don't tell: A change in medical student attitude in obstetrics/gynecology clerkships toward seeking consent with pelvic examinations on anesthetized patient. *American Journal of Obstetrics & Gynecology*, *188*(2), 575-579.

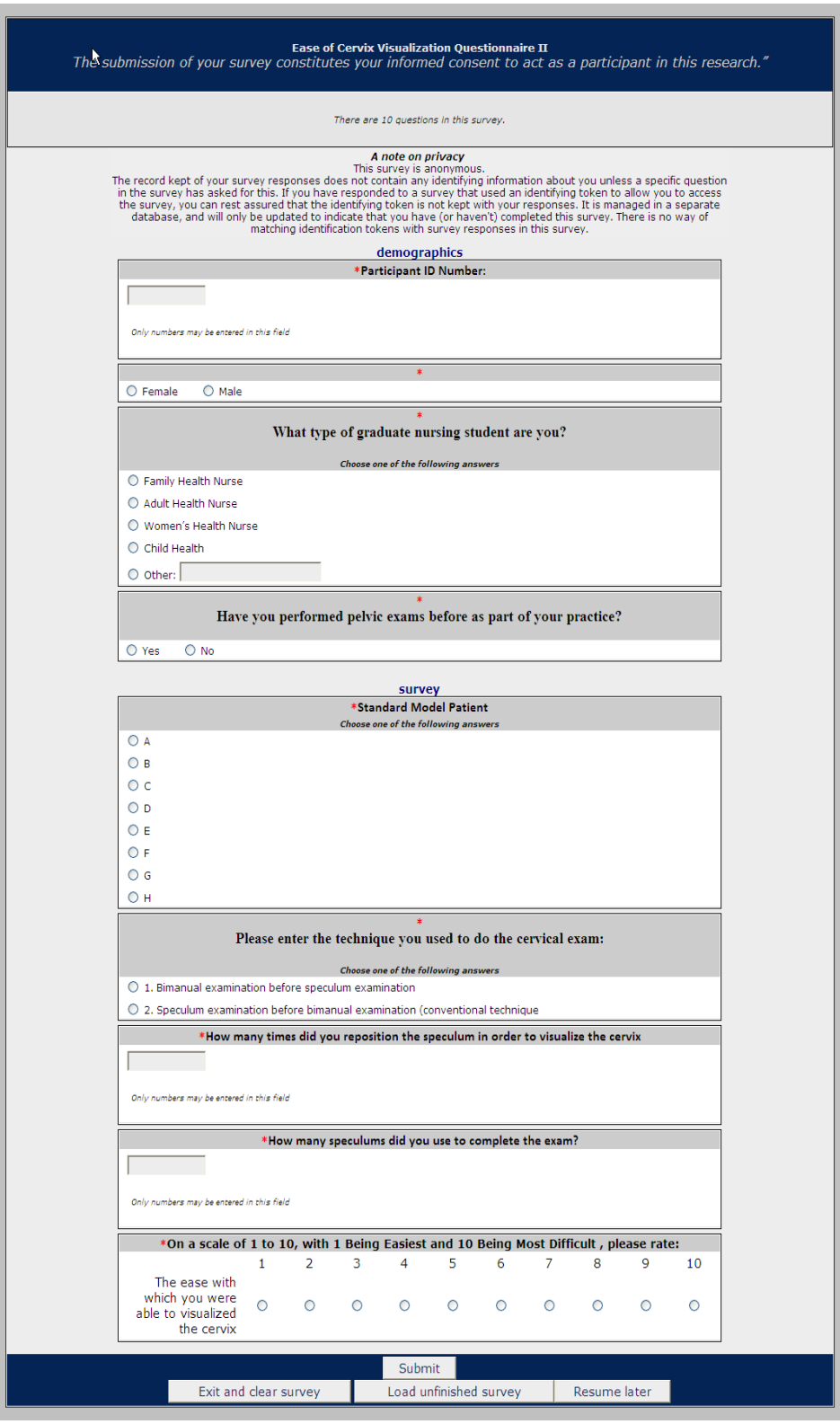
Appendix A

Timeline for Project

Procedure	Date/Month
Complete study proposal/obtain capstone approval	September 2010
Submit to TWU IRB for approval	Approval obtained 10/13/2010
Present study materials/concepts to APRN students	November 1, 2010
Collect data on day of skills lab	November 8, 2010
Code questionnaires into an open-**source, interactive web-based survey (LimeSurvey®)/Clean Data**	November 2010
Statistical calculation and analysis of results	December 2010-March 2011
Complete analysis and author capstone presentation	January 2011-March 2011
Present findings and submit for publication	April 2011 (to be completed)

Appendix B

Ease of Cervix Visualization Questionnaire II



Ease of Cervix Visualization Questionnaire II

The submission of your survey constitutes your informed consent to act as a participant in this research."

There are 10 questions in this survey.

A note on privacy

This survey is anonymous.
The record kept of your survey responses does not contain any identifying information about you unless a specific question in the survey has asked for this. If you have responded to a survey that used an identifying token to allow you to access the survey, you can rest assured that the identifying token is not kept with your responses. It is managed in a separate database, and will only be updated to indicate that you have (or haven't) completed this survey. There is no way of matching identification tokens with survey responses in this survey.

demographics

*Participant ID Number:

Only numbers may be entered in this field

*

○ Female ○ Male

*

What type of graduate nursing student are you?

Choose one of the following answers

○ Family Health Nurse
○ Adult Health Nurse
○ Women's Health Nurse
○ Child Health
○ Other:

*

Have you performed pelvic exams before as part of your practice?

○ Yes ○ No

survey

*Standard Model Patient

Choose one of the following answers

○ A
○ B
○ C
○ D
○ E
○ F
○ G
○ H

*

Please enter the technique you used to do the cervical exam:

Choose one of the following answers

○ 1. Bimanual examination before speculum examination
○ 2. Speculum examination before bimanual examination (conventional technique

*How many times did you reposition the speculum in order to visualize the cervix

Only numbers may be entered in this field

*How many speculums did you use to complete the exam?

Only numbers may be entered in this field

*On a scale of 1 to 10, with 1 Being Easiest and 10 Being Most Difficult , please rate:

	1	2	3	4	5	6	7	8	9	10
The ease with which you were able to visualized the cervix	○	○	○	○	○	○	○	○	○	○

Submit

Exit and clear survey | Load unfinished survey | Resume later

Appendix C

TWU Faculty Approval and Permission for Use of Ease of Cervical Visualization Questionnaire II

October 20, 2010

Julie Nelson
263 Private Road #4909
Haslet, Texas 76052

Dear Julie,

You have my permission to modify (as submitted) and use the Ease of Cervix Visualization Questionnaire in your DNP capstone project. I wish you success with your project.

This letter also serves as TWU faculty permission for the Ease of Cervical Visualization Capstone project for Julie A. Nelson recently approved by the TWU IRB.

Sincerely,

Sherry Carter, RN, WHNP-BC, PhD

Associate Professor
TWU, College of Nursing, Dallas Campus
5500 Southwestern Medical Avenue
Dallas, TX 75235-7299

Appendix D

IRB Approval from Texas Woman's University

TWU
TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

School of Occupational Therapy
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October 13, 2010

Ms. Julie A. Nelson
163 Private Road #4909
Hasler, TX 76052

Dear Ms. Nelson:

Re: *Does bimanual examination prior to speculum examination ease cervical visualization in advanced practice nursing students (Protocol #: 16279)*

Your application to the IRB was reviewed and approved on 10/13/2010. This approval is valid for one (1) year. The study may not continue after the approval period without additional IRB review and approval for continuation. It is your responsibility to assure that this study is not conducted beyond the expiration date.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. If you have any questions, please contact the TWU IRB.

A final report must be submitted to the IRB at the conclusion of the study. If using a consent form, copies of the signed informed consent are to be submitted with the final report before the study file can be closed.

The Institutional Review Board is pleased to acknowledge your sense of responsibility for ethical research. If you have any questions concerning this review, please contact me at (214) 706-2461 or email SLin@twu.edu.

Sincerely,

Suh-Jen Lin

Dr. Suh-Jen Lin, Chair
Institutional Review Board - Dallas

cc. Dr. Stephanie Woods, College of Nursing - Dallas
Graduate School

Appendix E

Correlation Matrix of Key Variables

Table 1

Correlation Matrix of Key Variables

			Height	Weight	Times repositioned*	Ease of Cervix Visualization***
Spearman's rho	Height	Correlation Coefficient	1.000			
		Sig. (2-tailed)				
		N	37			
	Weight	Correlation Coefficient	.770**	1.000		
		Sig. (2-tailed)	.000			
		N	37	37		
	Times repositioned*	Correlation Coefficient	-.519**	-.362*	1.000	
		Sig. (2-tailed)	.001	.028		
		N	37	37	37	
	Ease of Cervix Visualization ***	Correlation Coefficient	-.099	.040	.483**	1.000
		Sig. (2-tailed)	.558	.815	.002	
		N	37	37	37	37

Note. * = How many times did you reposition the speculum in order to visualize the cervix? ** = Correlation is significant at the 0.01 level (2-tailed). * = Correlation is significant at the 0.05 level (2-tailed). *** = [1 Being Easiest and 10 Being Most Difficult]

Appendix F

Outline for PowerPoint Slides for Pelvic Examination Presentation (Technique #1)

Bimanual exam before the speculum exam: Technique #1

Inspect/palpate external genitalia

Bimanual exam

Speculum exam and sample collection

Examination procedure:

Bimanual Exam

Position patient flat in the supine position head supported with a small pillow.

This position affords relaxation of the abdominal rectus muscle.

Visually inspect and palpate the external genitalia

Apply approx. 1cc of water based lubricant to the tip on the index finger that you will use for the internal examination.

Gently insert finger “face down” and advance approx. one inch.

Spread the lubricant over the lower 1/3 of the vagina.

Gently press the vaginal introitus toward the perineal body.

Gently insert middle finger and rotate so that fingers are pointing upward.

Grasp the cervix between the two fingers.

Assess cervix for shape, texture, size, symmetry and cervical motion tenderness.

Avoid disrupting ecotocervical epithelial cells that are targeted for cervical cytology sampling and limit the amount of vaginal lubricant used to no more than 1 cc.

Place second hand on patient's lower abdomen (if glove on the external hand gets dirty, replace) and gently press down while sliding the examining fingers under the cervix into posterior cul-de-sac and assess the uterus for size, shape, texture, mobility, tenderness and position.

Palpate the left and right adnexa.

Mentally visualize the orientation (location) of the cervix within the vaginal vault as you withdraw your examining fingers.

Speculum Examination

Put on a fresh pair of gloves

Select speculum to be used for the examination.

Insert Speculum

Position speculum diagonally and with slight pressure toward perineal body

Rotate and advance speculum to access the cervix.

If needed, the base of speculum may be opened to secure the speculum firmly in the vagina and position and facilitate visualization of the cervix.

Obtain samples for vaginal wet prep, cervical cytology and cervical cultures as indicated.

Withdraw speculum after sample collection.

If rectal vaginal exam is indicated, put on a fresh pair of gloves and perform the exam.

Complete the Questionnaire

THANK YOU! (Carter et al., 2011, pp. 7-8)

Appendix G

Outline for PowerPoint Slides for Pelvic Examination Presentation (Technique #2)

Speculum exam before the Bimanual exam (traditional technique): Technique #2

Inspect/palpate external genitalia

Speculum exam and sample collection

Bimanual exam

Examination Procedure:

Speculum Examination

Position patient flat in the supine position head supported with a small pillow.

This position affords relaxation of the abdominal rectus muscle.

Visually inspect and palpate the external genitalia

Select speculum to be used for the examination.

Insert Speculum

Position speculum diagonally and with slight pressure toward perineal body

Rotate and advance speculum to access the cervix.

If needed, the base of speculum may be opened to secure the speculum firmly in the vagina and position and facilitate visualization of the cervix.

Obtain samples for vaginal wet prep, cervical cytology and cervical cultures as indicated.

Withdraw speculum after sample collection.

Remove speculum-diagonally

Bimanual examination:

Put on a fresh pair of gloves

Apply approx. 1cc of water based lubricant to the tip on the index finger that you will use for the internal examination.

Gently insert finger “face down” and advance approx. one inch.

Spread the lubricant over the lower 1/3 of the vagina.

Gently press the vaginal introitus toward the perineal body.

Gently insert middle finger and rotate so that fingers are pointing upward.

Grasp the cervix between the two fingers.

Assess cervix for shape, texture, size, symmetry and cervical motion tenderness.

Avoid disrupting ecotocervical epithelial cells that are targeted for cervical cytology sampling and limit the amount of vaginal lubricant used to no more than 1 cc.

Place second hand on patient’s lower abdomen (if glove on the external hand gets dirty, replace) and gently press down while sliding the examining fingers under the cervix into posterior cul-de-sac and assess the uterus for size, shape, texture, mobility, tenderness and position.

Palpate the left and right adnexa.

Mentally visualize the orientation (location) of the cervix within the vaginal vault as you withdraw your examining fingers.

If rectal vaginal exam is indicated, put on a fresh pair of gloves and perform the exam.

Complete the Questionnaire

THANK YOU! (Carter et al, 2011, pp. 7-8).