2013-05-13

Comprehensive Video-Module Instruction an Alternative for Teaching IUD Insertion to Family Medicine Residents

Garcia-Rodriguez, Juan Antonio

UNIVERSITY OF CALGARY

Comprehensive Video-Module Instruction an Alternative for Teaching IUD Insertion to Family Medicine Residents

by

Juan Antonio Garcia-Rodriguez

A THESIS SUBMITTED TO THE FACULTY OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF MEDICAL SCIENCE

CALGARY, ALBERTA

May, 2013

Abstract

There are different challenges currently faced by the Department of Family Medicine to impart procedural skills instruction to residents. An IUD video-module was created to provide an alternative approach for such training, offering the possibility of its use in any clinical setting or teaching situation. A randomized, two group experimental research design was used to focused on the comparison of residents' procedural skills performance between the instruction methods (video-module vs. traditional approach) to teaching IUD insertion. The results showed that both methods were effective in providing procedural skill instruction. The performance scores were significantly higher in the video-module group, but there were no significant differences in residents' satisfaction scores. There was no correlation between the different scores and sex or age, or between performance and level of satisfaction. In conclusion, the use of video-module instruction is effective to provide IUD training and significantly higher than the gold standard in the performance component.

Acknowledgments

I am deeply indebted to my excellent supervisor Dr. Tyrone Donnon for his valuable guidance, support and help during the planning and developing of this work. I would also like to express my very great appreciation to the members of the supervisory committee, Dr. Claudio Violato, Dr, Aliya Kassam and Dr. Mone Palacios-Mackay for all their support.

My special gratitude goes out to all the members of the Family Medicine Department, assistants and all the residents who participated during the study day.

Finally, I would like to particularly thank my family, Marion, Emily and Sean for their support, patience and understanding during the development of this project.

TABLE OF CONTENTS

List of Tables

List of Figures

Chapter One: INTRODUCTION

Background

Most of the faculties of medicine in Canada have a limited number of skilled faculty who can teach procedural skills to medical students, residents and practicing physicians. In the Department of Family Medicine at the University of Calgary the schedules of the learners and teachers are very busy, the locations of work often widely dispersed and it is difficult to schedule them for group learning opportunities. Among the procedures to impart instruction, intrauterine device (IUD) insertion is one of the most frequently taught, as it is commonly performed in Family Medicine offices due to its cost effectiveness and low rates of failure. For this reason, the present study focuses on the techniques for IUD insertion teaching.

One of the traditional methods of IUD training in Calgary is the attendance to one of the two IUD insertion teaching clinics that exist in the city. Unfortunately, those clinics can only take two learners at a time and long waiting lists exist to access this training opportunity. Besides, the residents are able to schedule the teaching sessions only during free days from clinics or during "elective rotation" time, making it even more difficult to obtain. The attendance to those clinics involves frequent displacement in the city and in no way are the learners involved in the assessment or follow-up of the patients.

The mentioned difficulties to obtain IUD insertion training are not an isolated problem in the Family Medicine residency program as similar challenges for IUD training has also been described in other settings and countries.[1] Using video-module instruction is, therefore, an attractive alternative and enables busy faculty to teach more students and in a more comprehensive way.

Family physicians tend to teach residents in their clinical offices. Family Medicine residents at the University of Calgary have traditionally attended daily for two, two-month blocks with a half-day "back in the home clinic" every week for the remainder of the two-year residency, or various other combinations of block and callback options. This provides the ideal situation for one-on-one faculty instruction during clinics either when a patient does not show up, or after clinic. This study investigates the possibility of teaching residents using DVD or computed-based video-modules with one-on-one instruction by their regular preceptors, and is intended to explore the suitability and efficacy of this method of instruction conforming to usual practice in a clinic without requiring any additional scheduling or travel time.

For this kind of clinical practice training, it is intended that once the learners have been exposed to the learning module they will practice on mannequins or anatomical educational models until they are judged to be competent based on their clinical performance of the procedure as evaluated by preceptors on a comprehensive checklist. Once this procedural training is completed they are expected to be able to perform the procedure on real patients under direct guidance by their preceptors.

Teaching medical procedures to residents is an important task for academic physicians and clinical preceptors during Family Medicine rotations. IUD insertion is a relevant procedure as it is one of the more frequently practiced in Family Medicine offices[2-3] and is included in the assessment of competence for Canadian family medicine training.[4]

There is a growing interest in teaching medical procedures and it has become a mandate from regulatory entities. The College of Family Physicians of Canada (CFPC)

has determined that teaching procedural skills is a priority and requirement in the formation of Family Medicine residents. The College, through the Section of Teachers of Family Medicine, commissioned the Working Group on Procedural Skills in 2003 to identify a list of core and enhanced skills for Canadian family physicians' training. One of the skills included on this list is intrauterine device (IUD) insertion.[4] It also has stated that the technical abilities to perform a certain number of procedures are one of the skill dimensions of competency and is a requisite for certification for independent practice.[5]

Statement of the Problem

The Family Medicine residents at the University of Calgary are currently facing different difficulties to obtain instruction in the procedures needed for independent practice; IUD insertion was chosen as a procedure to study this situation, as it is useful, popular and frequently used in any Family Medicine clinic. As alternative methods of procedural training are required to provide an answer, an evaluation of a video-module instruction approach needs to be conducted to determine if this is an adequate procedural training method for IUD insertion that could provide a potential solution to the challenges faced by residents and preceptors involved in such training.

Summary

With the increasing demands on both family medicine clinicians and residents, it has become difficult to provide and access training on specific procedures such as IUD insertion. With the advancement in communication technologies and accessibility of the internet, the focus of the present study is to determine whether the use of video-module instruction can provide residents with the necessary knowledge and skills to perform an

IUD insertion correctly when compared with the traditional form of instruction. In part, the goal of this study was to investigate whether the use of video-module instruction for IUD insertion can improve residents' knowledge in regards to the indications, contraindications, potential complications and post-procedure recommendations related to this procedure. The acceptability of this potential online approach will be largely based on whether residents are satisfied that the educational instruction using a video-module was effective to obtain the necessary knowledge when compared to the traditional form of training currently offered. While the use of online video-module instruction may provide an alternative to training that is more accessible than the traditional approach, a comparison of family medicine residents' ability to perform an IUD insertion in a simulated scenario was the primary outcome measure investigated in this study.

Chapter Two: LITERATURE REVIEW

During the last decade, medical educators have been facing a growing demand to include computer-assisted instructional (CAI) materials into their curricula. Videos and DVDs are one of the venues used to provide educational programs, however, it is difficult to find and develop effective and quality video-module instructional materials.[6] Currently, there is a large number of poorly designed instructional videos frequently accessible through different venues such as the internet or commercially available videos that provide very limited instruction. As such, the current concern is to find adequate Information and Communication Technologies (ICT) in medical education and to develop effective and appealingly designed video instruction materials.[7] Furthermore, the development and application of this kind of technology is part of the increasing trend and expectation of trainees in medical education familiar with the use of simulation, multi-media, and online resources.[8]

Despite the fact that IUD insertion is a useful and required procedure among the armamentarium of any family physician, a lack of confidence in the ability to provide IUD insertion training among Family Medicine residency programs is frequently found. In particular, a survey of residents from five Ontario Family Medicine programs found that only 34% of urban-trained and 19% of rural-trained family medicine residents felt competent with IUD insertion at graduation from their residency program.[9] A lack of experience and/or technical competence with IUD insertion may prevent physicians from properly counselling patients on the advantages and disadvantages of an IUD and contribute to women making uninformed decisions regarding alternate contraceptive choices.[10]

The difficulties that are locally encountered in the Department of Family Medicine at the University of Calgary in the ability to provide accessible IUD insertion training are shared by programs of other Canadian provinces and countries.[9] For instance in the United Kingdom a number of challenges to obtain IUD insertion training for General Practitioners (GPs) have been identified, many of which are comparable to the Canadian medical training situation. For example, family planning clinics in the UK are often geared towards adolescents, a population that is not as likely to use IUDs, resulting in fewer clinical settings to receive training. In addition, smaller family planning clinics may not have a designated IUD implant clinic. While large cities are more likely to have large, multi-faceted family planning clinics to act as training centres, rural areas and the doctors servicing these areas may not have access to this type of clinic. This may mean that general practitioners must travel long distances to receive training, with no guarantee that suitable patients will be available to practice the specific techniques on. There are also logistical issues in running an IUD insertion clinic. Appointments are at least 30 minutes in length, and should a patient miss an appointment the opportunity to learn and practice the procedure is lost. Patients may also have their appointment scheduled at an unsuitable time in their cycle, requiring a return appointment, or after counselling choose not to be fitted with an IUD; both situations result in another missed training opportunity.[1]

Clinical observation alone may also be inadequate to teach practical elements of contraception because of variability in the range of cases seen, the commitment of the training physician to teaching, and the willingness of patients to consent to a medical student being present.[11]

IUD insertion training in other teaching settings

The instruction imparted to teach this contraceptive technique is usually based and tailored to the local resources, needs and challenges of the teaching environment and the traditional methods that have been used for that purpose.

In the United Kingdom, general practitioners find it difficult to obtain training in IUD insertion, despite the fact that many patients look to their general practitioners for this procedure. In the UK, general practitioners intending to provide IUDs as part of their practice are recommended to follow the training program of the Faculty of Sexual and Reproductive Healthcare (FSRH) and obtain the Letter of Competence in Intrauterine Techniques (LoC IUT). Instructing doctors are trained by the FSRH who hold a Letter of Competence of Medical Education (LoC Med) as recognition of their ability to provide physician training on this procedure. These instructing doctors are IUD trainers who normally perform instruction in a community family planning clinical setting. Doctors interested in having IUD training must first obtain a Diploma from the FSRH and be re-accredited every 5 years. The trainee must attend family planning clinics in order to acquire the practical skills and must perform at least seven IUD insertions in order to obtain certification.[1]

Some medical schools in Britain have adopted a mock family planning clinic setting to teach elements of contraceptive to fourth year medical students.[11] The goal was to create a clinic setting where students could learn practical procedures, experience a community clinic and interact with staff, but in a consistent teaching environment. Following an introductory session in the clinic reception area, students rotate through four stations. In the first station: reception, the students gained an understanding of the role of

the receptionist, including support for anxious clients and maintaining confidentiality. In the second station a nurse demonstrates correct use of male and female condoms on models, with students practicing teaching this skill. The two remaining stations are doctor led. In one, students are taught basic information on oral contraception and patient counselling, and practice teaching the correct use of this form of contraception. In the last station, the students are given basic information on intrauterine contraception and practiced fitting IUDs on models. Following the session, students take a quiz on essential contraception knowledge.

The use of interactive devices that are not highly technical has also been used at some teaching centres in the United States, as is the case of using a papaya as a uterine model to teach third year medical students intrauterine procedures (endometrial biopsy, uterine aspiration) including IUD insertion.[12] The instruction is performed by poking holes in the stem end of the papaya to simulate the cervix and perform bimanual examination. Case studies are then presented to the learners that utilize the papaya simulated uterus as a hands-on teaching tool. One of the cases involves placing an IUD device into the model. As the case is discussed, elements such as pre-procedure evaluation, counselling, “no touch” technique and the use of local, cervical anesthesia are covered.[12] Studies done on this teaching method demonstrated that students enjoyed the opportunity to practice the gynecological techniques on the papaya simulated uterus, with 90% of the students rating the workshop as highly valuable. There was also a statistically significant increase in correctly answering knowledge-based questions following the workshop, which persisted to the end of the students’ clinical rotation ($p \leq 0.001$). Before the workshop, 48% of students answered at least 75% of the questions correctly. Upon

completion of the workshop, 98% of students answered at least 75% of the questions correctly. In addition, students demonstrated a statistically significant increase in their level of comfort in counselling patients regarding the intrauterine procedures performed during the workshop. In particular, comfort levels regarding counselling patients on IUD placement increased from 46% to 94% following the papaya simulated uterus workshop.[12]

Other forms of teaching that has been used are instructional workshops containing teaching stations. One study performed by Nielsen et al.,[13] offered an orientation program for medical students that focused on outpatient clinical skills and was assessed using pre-/post-testing and anonymous student evaluations. Faculty, fellows and chief residents provided training at 10 stations, one of which was an intrauterine device insertion scenario. Each station consisted of 30 minutes of instruction, both didactic and "hands on", which was conducted in small groups of four to five students. The IUD training station included a training model to simulate the cervix. Analysis of pre- and post-test scores demonstrated a non-significant increase in post-test scores, but 64% of residents rated the program as "very helpful" and recommended that the program be implemented on a yearly basis with more 'hands-on' practice time.[13]

Simulation by using pelvic models is of great importance for training in this type of procedures. The usefulness of pelvic models in training IUD insertion has been evaluated in an observational study in India using post-training evaluation forms.[14] The trainer and the trainees all agreed that the model was very useful, easy to use and realistic. Trainees commented that the pelvic model simulator helped them gain confidence and the skills needed in IUD insertion. The results of this study were supported by a similar study that employed the use of pelvic models to train midwives in Thailand.[15] This study found

that practicing on an anatomical model decreased the time to achieve competency. The investigators were also of the opinion that because the learners' skills were fairly developed by the time they saw an actual patient, the potential for complications due to poor technique was reduced and the providers were more confident and relaxed when seeing their first patient for an IUD insertion.

Teaching interventions using video-instruction

As the purpose of teaching is to facilitate learning, the use of multimedia education or computer-based learning tools can be very powerful if used appropriately. The success of using these instructional technologies depends on the educational objectives and corresponding fit with the instructional design framework selected. At the same time, it is crucial to identify specifically the nature of the learning outcomes that are intended and to develop the needed approach to teaching that will facilitate the desired knowledge, skills or attitudes.[16] An important further step that complements the chosen teaching and learning strategy, is the development of reliable and valid measures of assessment to determine if the intended learning outcomes have taken place.

The use of multimedia instruction has been established as a potential teaching technique that can be equal to or more effective than traditional lectures[72] and textbooks and, in some cases, trend towards increased student satisfaction. Multimedia presentations can encompass many formats including text, audio, video, and graphics that are intended to encourage learning and can be used to simulate clinical scenarios.[17] But it is important to bear in mind that the use of media-based teaching or computer-based electronic-teaching (e-teaching) does not ensure or facilitate learning per se.[18] This goal is only accomplished if multimedia teaching principles are included in their development

and use in order to complement the chosen instructional objectives and intended learning outcomes.[19] For example, twelve candidates for a fellowship in female pelvic and reconstructive surgery were shown a six-minute video on laparoscopic suturing before the procedure and substantial improvement in time to complete the procedures were reported.[20] In another study, sixty first year medical students were taught suturing and two blinded experts assessed their performance on a Global Rating Scale which assessed tissue handling, efficient hand movements, instrument use, flow, and overall performance.[21] After a month only those who used self study with computer-based video instruction or expert feedback after trials maintained their improvement in skills, whereas those who received expert feedback during trials only showed no statistically significant improvement at one month. In a similar study comparing expert instruction and computer-based video training in surgical skills, 24 first and second year medical students were taught suturing and two blinded experts assessed their performance with a Global Rating scale. In addition, magnets were attached to the students' hands to videotaped and assess the number of movements, time, and total path distance travelled to complete the suturing tasks. It was found that video-based instruction was as effective as video-based plus expert instruction, and the authors concluded that the task was simple enough that video instruction alone provided sufficient information and training for the students.[22] Another study concluded that the use of an instructional DVD is more effective than face-to-face didactic teaching for teaching pediatric intra-osseous needle insertion to medical professionals.[72]

The information obtained from previous studies suggests that video instruction combined with expert one-on-one procedural instruction, and demonstration of both the

correct method and the errors to be avoided, is the optimum instructional design for the teaching and learning of technical skills. For instance, a systematic review of teaching surgical and emergency techniques to medical students identified ten RCTs where teaching suturing skills was compared with a control group.[23] The group that was shown both the correct method and errors in tying knots improved their scores ($p < 0.01$), but the group that was shown no errors, only the correct methods, and groups shown only errors did not improve.[24] Students who participated in a computer-assisted teaching session with individualized feedback from surgical faculty, however, showed greater improvement than those who only received computer instruction only ($p < 0.001$).[25] In one study, students who practiced in groups of 6 to 8 students with each student using their own computer, and students in pairs who used only one computer between them and gave each other feedback improved in the proportion of correctly tied knots ($p < 0.001$); although the authors concluded that peers should not be a substitute for expert faculty in more complex exercises.[26] In a study where a group which learned from a computer and a group that were given lectures did not differ in the proportions of correctly tied square knots or in the average time to complete the knot.[27] In a comparison between computer, videotape and didactic instruction a study found that the computer group had more complete knots at both immediate ($p < 0.01$) and one-month follow up ($p < 0.01$) than either the didactic or videotape groups; although the didactic group scored higher on MCQ examinations both times.[28]

Some studies were considered for the learning situation that best mirrored the learning tasks required for IUD insertion and a study of instruction in anterior nasal packing for epistaxis was identified.[29] Knowledge of the technique of anterior nasal

packing was assessed with a 17-item short answer test and performance on a model was assessed by a 16-item checklist.

Finally, Dent identifies the importance and relevance for the use of videos for instructional purposes with today's learner, stating that the majority of medial students are visual learners and that their eventual medical practice will rely largely on visual cues.[16] Furthermore, the use of videos agrees with the existing learning practices of the current generation of medical students that are exposed to them for multiple personal and academic purposes. Videos also are a very important part of e-learning which is transforming the medical teaching practice all over the word and is part of the online teaching environment; text based information is constantly moving towards image-based information, therefore the use of videos is now a fundamental part of medical instructional design. It has been stated that universities and medical programs have to respond to the IT (information technology) revolution instead of ignoring it.[16]

As a summary of the concepts related to the teaching of a procedure, such as an IUD insertion, the literature review identifies some key points that delineates a framework for the online, video-module instruction intent of this study. In the first instance procedural teaching is optimized if it is based on the local needs of the students and faculty, and tailored within the resources allocated for the instructional delivery format.[1,11,13] In particular, the use of multimedia methods have been shown to be highly effective for procedural skills instruction.[17,19] Specifically, the demonstration of both the correct and incorrect techniques enhances students' learning and appropriate performance of procedural skill tasks.[23,24] In many studies, the importance of expert feedback also enhances the learning experience that leading to better performance results.[20,21,22,25] In the

case of an IUD insertion, the use of pelvic models has been shown to be an effective hands-on strategy for teaching and learning.[14] Nevertheless, the development of reliable and valid assessment measures is a necessary component for evaluating the learning outcomes and the instructional process used to develop students' procedure skills.[16,29]

Orientations to learning

The acquisition of skills is a complex process and the teaching involved in that process requires some recognition of the different ways in which learners learn. Bearing in mind the different orientation to learning helps to develop more useful methods and learning outcome measures in order to accomplish the goal of providing effective teaching and learning. For this reason it is appropriate to provide an overview of the different theoretical models that have been developed to describe the process of how students' learn. There are five orientations to learning that explain this process: the behaviourist, cognitivist, constructivist, social learning theory and humanistic approaches to learning.

Some authors have made the point of stating that not any one of these theories applies to every medical education scenario, but rather that teachers can enhance their practice by drawing on concepts and understanding from a multitude of these different learning orientations.[56] For this reason the following paragraphs will summarize the main concepts pertaining to each of those orientations of learning and after each, a practical application of those concepts to the IUD insertion procedural instruction/training intended for this study.

The behaviourist approach to teaching directs its focus on how the instruction is delivered and emphasizes the significance of observable behaviours through stimulus-response or operant conditioning.[42] This theory of learning focuses on the learner's

observable behaviour or response to a stimuli provided by the instructor within the context of the environment. Positive and negative feedback (operant conditioning) provided by the instructor reinforces the appropriate responses to the stimulus in order to obtain a desired behaviour or learning outcome.[49] The role of the teacher is to arrange the learning environment in such a way to achieve the desired response(s) and requires the learners to practice the process repeatedly until they are appropriately trained (e.g., completion of a simple task to a more complex procedure).[43,44]

Practical applications in medicine for psychomotor skill development include the understanding of the basic skills (and related knowledge) typically through "drill-and-practice" simulation sessions. From a behaviourist orientation, the IUD insertion procedure instruction or training, in part, uses a "drill-and-practice" simulation activity that reflects how the procedure would eventual be used in clinic situations. The repetitive nature of the video-module instructional module (allowing the learner to selectively re-review each of the steps) encourages the memorization and mastery of the steps required to perform an IUD insertion.

The cognitivist orientation to learning the knowledge and skills required are purported to be primarily a cognitive process where internal processes related to memory, perception, analysis, recognition, information processing, application, creation, understanding and evaluation allow the learner to assign meaning to events.[48] Regarding this theory, learning occurs when the learner processes the obtained information and creates meaning based on their ability to process subsequent experience,[46] and clue components that are related to these cognitive processes to allow reflexive critical thinking.[50] This allows for a connection to occur that links the knowledge that is being

learned and the knowledge that the learner already possess.[46] The basic goal of instruction in this theory is to help the learner to develop the skills and capacity needed to learn more effectively or, as articulated by Novac,[51] help them to ”learn how to learn”. This is achieved by having the instructor focus on how the students learn best and how an instruction can be presented to best achieve the learning outcomes.[47]

The cognitivist orientation to learning in the process of teaching student on how to perform an IUD insertion depends on the establishment of an instructional method that connections and links the theoretical concepts learned in medical school with the procedural instructions and psychomotor skills presented in the video-module. It is intended that this process will facilitate the acquisition and recall of the knowledge and skills related to this procedure, and that the learner will be able to extract the core concepts to guide the performance of the IUD insertion successfully.

In the constructivist orientation to learning students learn by constructing meaning from the content through experiences in the learning environment. In essence, the learner integrates and builds on these experiences to create more complex understandings or organizations of the knowledge or processes required to achieve expertise or mastery of the skills.[47] The learner selects the information, transforms it, makes hypotheses and decisions; for that purpose the learner constructs elaborate schemas to give meaning and organization to the information acquired.[59] It is that learner’s internal construction of meaning and understandings of the lived experiences where the locus of learning resides. In this approach the teacher is a guide, not a transmitter, who facilitates critical reflection and helps the student to obtain meaning based on this existing organization of knowledge and skills that the experts have achieved. The teacher’s goal is to actively engage the

learner in negotiation meaning and facilitate effective group interaction to achieve specific knowledge and skill development.[52] This process allows comprehensive understandings to emerge and helps learners to reach consensus of meaning;[53] some research approaches used in this orientation include appreciative inquiry[55] and participatory action research.[56] Manifestations of learning from the constructivist orientation perspective are based on the ideas of experiential learning and the reflective practitioner.

The procedural skills training involved in the IUD insertion training session is based, in part, on the learners creating their own mental schemas based on the instructional experiences introduced in the video-module. For example, the video-module instruction allows for the learners to receive feedback at the end of the session, which encourages the students to reflect on their practice and in turn allows them to construct meaning from what they experienced during the hands-on training.

Based on a social learning theory orientation, the learning process occurs by observation and modeling within a social context that, in part, encourages learning and the development of meaning from formal and informal interactions. A student who is in the process of learning a skill or acquiring knowledge will choose to imitate and reinforce the skill by rehearsing it in practice.[57] This approach can seem quite similar to the behaviourist model, but the difference resides in the fact that in social learning theory learning can occur by observation alone without active participation, as such the student makes a cognitive representation of the skill that is being learned, stores the image of the modeled behaviour, and when needed for performance the learner retrieves that image and applies it.[47] This orientation applies clearly to the skills training provided with the video-module approach to instruction used in the present study, as the learner observes a role

modeling activity being performed in a video by an instructor fully skilled in that technique, then creates the appropriate knowledge and skills required for it and, ultimately, uses the gain knowledge and skills to complete the IUD insertion techniques in a simulative environment.

From the humanistic orientation to learning, the learning process is achieved by a personal act to fulfil the learner's own potential. The process of learning is self-initiated and based on self-motivation.[58] The main focus on learning in this approach is for the learners to be self-directed and autonomous in their learning process and the educator facilitates this by focusing on the developing of the person as a whole. As the ultimate purpose of the present work is to allow learners to obtain the knowledge and skills for the IUD insertion procedure at their own pace, and under their own autonomy based on the particular characteristics and constrains of the clinical setting of training, this self-regulated approach to instruction or training applies very well. As such, the initial part of training using the video-module instruction is based on a self-directed approach to learning by reviewing the video and supplementary documents. Furthermore, this method of instruction is accessible and reflective of other computer-/video-assisted learning activities, which are at the present moment being increasingly used in medical education for self-directed learning purposes.

Accuracy of the Measurement Instruments

In the process of measuring students' learning outcomes (i.e., knowledge, skills and attitudes), it is important that the instruments used or developed achieve some level of accuracy as a function of their reliability and validity.

Validity

Validity is the extent to which a test measures what it claims to measure and it is essential for a test to be valid in order for the results to be interpreted accurately. Hopkins defines validity as "the 'correctness' of the inferences made from performance on a measure".[36] The primary criterion for evaluating the psychometric characteristics of any measurement is validity and there are different types to consider. Face validity is based on informal opinion and is a reflection of whether the test or instrument appears to be a measure of what it is suppose to be measuring (i.e., knowledge, skills and/or attitudes); note that this is a weak form of validity in that it involves no formal assessment and is generally based on perception. Face validity can be used as an initial assessment, but should be followed by a more rigorous statistical analysis of subsequent student performance.

Content validity is a method of investigating the degree to which a test measures the intended content or, or in another words, it determines if a measure correctly represents all aspects of the anticipated instructional or learning objectives. It uses a logical process and connections are determined between items of a test (and the total content as a whole) and the knowledge, task or skills that are expected to be performed. This is achieved by gathering a group of experts in the measured field or content area, and requesting them to review the test based on a table of specifications or blueprint. The experts should study the list of content areas that are included in the table of specifications, and review the items to ensure that the measurement instruments meet the criteria for the assessment of the knowledge or skills to be mastered. The experts should

also give their opinion and judgment about each item in regards to expectations for minimum performance levels.

Criterion-related validity is a standard method used to evaluate a measure with another instrument that is potentially assessing similar knowledge or skill developments, and is commonly used to reflect a measure at a current time or in the future. As such, criterion-related validity includes two types: concurrent and predictive validity.

Concurrent validity uses a measure of association (i.e., a correlation coefficient) between variables at any one testing time or period to determine whether assessments of similar constructs converge or diverge. A strong correlation between 'like' measures of learners' knowledge, skills or attitudes, is an indication of the construct validity of the assessed measures of interest. Predictive validity focuses on assessing the degree of association as a function of how well one measure will predict performance on a similar measure on future performance. It is similar to concurrent validity in assessing the performance and the mastery status of the participants, but differs in the fact that the time period of the assessment occurs at the same time (concurrently) or at a later time (predictive). For example, the assessment of hand-eye coordination with first year medical students may be an indication of future decisions of whether or not students will pursue surgery or other types of disciplines.

Finally, construct validity can be defined as the degree an instrument measures the characteristic being investigated and it refers to the extent to which a measuring instrument reflects a hypothetical construct or latent variable. This is tested, in part, when a variable that has been experimentally determined to measure a particular construct correlates strongly with another measure designed to assess similar theoretical or related

knowledge, skills or attitudes.

Reliability

Reliability reflects a measure of the internal consistency of an instrument; basically focuses on determining if the measurement tool produces stable and consistent results when used repeatedly. When talking about reliability there are some important concepts to take into account. First, a test can be understood as a sample of items that belong to a universe of such items. The correlation of the scores of that test with the corresponding scores from the universe of items is called an index of reliability. In Classical Test Theory the scored obtained from an examinee on a test is called an observed score. The observed score (X) is composed of the true score (T) and the measurement error (E): where $X = T+E$.[69] An examinee's true score, can be defined as "the expected value of the observed score over an infinite number of repeat administrations with the same examination".[70] The discrepancies between obtained scores and true scores are a result of measurement errors, which in turn reflect the standard error of measurement associated with the test.

The reliability or internal consistency of a test or instrument is a reflection of how well a measurement reflects students' educational achievements, competencies or performances.[65] The most common method used to measure the internal consistency of a test or instrument is to look at how well each item correlates with every other item as a function of each examinees (or evaluators) scores. For the purpose of this study, Cronbach's alpha provides the most robust measure of the internal consistency of tests or instruments and was used to assess the reliability obtained from the responses to the

written examinations, IUD insertion procedure checklist, and satisfaction survey developed for the purposes of this study.

Purpose of the Study

Based on the preceding discussion, the main purpose of this study was to investigate the effectiveness of using video-module instruction to provide high quality IUD insertion training to Family Medicine residents in comparison to a traditional method of training; which consists of attending a didactic instruction session at an IUD insertion clinic with procedural insertion practice performed on live patients, by one of the three gynaecologist assigned in the city for that purpose.

Ethics approval for this study was obtained from the office of Medical Bioethics - Conjoint Health Research Ethics Board of the University of Calgary. (Ethics ED: E-24522).

Research Question

Based on the preceding concern regarding procedural skills training for Family Medicine residents, the research question for the present study is:

How effective is the use of video-module instruction as a procedural skill teaching method to impart IUD insertion training for Family Medicine Residents?

The following are the specific research objectives:

1- Review the current teaching characteristics for procedural skills in the Family Medicine Postgraduate Program of the University of Calgary.

2- Review of current instructional methods used to teach IUD insertion to medical learners in training programs and medical schools; as well as the elements of

training and evaluation from previous studies that can be relevant to the development and assessment for this study.

3- Create the educational tools necessary to impart IUD insertion training to Family Medicine residents.

4- Develop and assess the reliability and validity of a performance checklist and satisfaction survey to evaluate the IUD insertion procedure training.

5- Evaluate the effectiveness of the IUD insertion training using video-module instruction in comparison with the current traditional approach used for residency training on this procedure.

Chapter Three: METHOD

This chapter provides a background on the procedural teaching provided at the Family Medicine Residency Program at the University of Calgary. Specifically, the development of the IUD video-module used for training the residents will be described, the experimental research design used in the present study will be outlined, the instruments used to assess the residents' knowledge, skills and satisfaction outlined, and the data collection and analysis described.

Settings

Procedural teaching for Family Medicine residents at the University of Calgary has had challenges in its content, settings and structure. Until recently, the Family Medicine Residency Program at the University of Calgary (FMRP-UC) had an established teaching system that used only two teaching clinics as a "home-base" for core teaching. In these clinics residents underwent two, two-month Family Medicine core rotations and weekly call-back days while completing the remainder of their residency rotations in different specialties and in other clinical care settings. A large part of the procedural skills teaching needed for family medicine was imparted at the two "home-base" teaching centers. Intra-uterine device (IUD) insertion is one such procedure that all residents are expected to complete by the end of their residency program.

IUD insertion is one of the procedures that family medicine residents indicate an interest in learning and is a procedure that is commonly performed in a family medicine clinic due to its cost-effectiveness and low rates of failure. The training of residents on the IUD insertion procedure is the focus of the present study and the use an alternative

teaching system (online, video-module teaching) could be a viable substitute to facilitate and optimize procedural skills teaching and learning in general. If found reliable, valid and feasible the video-module approach could be used to assist in teaching this particular procedure for residents, and could also facilitate the development of similar training modules to teach other procedural skills in our program and other similar teaching programs.

At the present time, the Family Residency Program at the University of Calgary is facing pressures to address the increasing number of residents admitted to the program and also to accommodate the current demand for curricular changes suggested by the College of Physicians of Canada (CFPC) for all the Family Medicine Residency Programs across Canada.[30-32] Within this context, procedural skills teaching must also comply with the new Triple-C competence based curriculum,[30] the Family Medicine CanMeds framework[32] and the four principles of Family Medicine identified by the CFPC.[33] IUD insertion has been listed by the CFPC among the 65 core procedures needed for certification for independent practice[34] and is itemized under the Genitourinary and Women's Health Procedures section (Appendix 1 and 2). Based on these expectations, IUD insertion is one of the procedures on which the resident's assessment of competence at the end of residency is based.[35]

In order to comply with the aforementioned demands, the Family Medicine Program at the University of Calgary has implemented a new curriculum, increased the number of teaching sites, and has markedly increased the number of preceptors and teachers. Among this new structure the teaching and learning of procedural skills, in particular IUD insertion, continues to be a challenge and the video-module teaching

system can prove to be a useful alternative, that fits well with the need for a more diverse teaching structure as well as conforming to the current expectations of residents and preceptors in the clinic setting.

General Overview of Study

This was a randomized, two group pre-/post-test (written) experimental research design that focused on the comparison of residents' procedural skills performance (post-test only) based on an alternative instructional intervention (video-module teaching) with the traditional approach to teaching IUD insertion. All of the incoming 2012, first-year Family Medicine residents (n = 70) were invited to participate in the study during the induction period at the beginning of their residency program in July. Residents were informed that their participation in this study was not mandatory and it would not have any implications on their residency grades. In order to ensure homogeneity, the exclusion criteria for the participants included individuals who had performed an IUD insertion during their clerkship or clinical training, or who have had a previous medical practice that involved IUD insertion (for example international medical graduate (IMG) residents with previous family medicine or gynaecology training or practice).

Thirty-nine residents agreed to participated in the study and provided signed consent. Using a random number generator computer program, the participants were randomly selected to be in one of two different instructional intervention groups: video-module or traditional approach to teaching IUD insertion. Each group was exposed to a different style of IUD insertion training session, either the traditional approach to instruction given by an academic gynaecologist or through the use of a video-module approach to instruction (Appendix 3). Nineteen participants were assigned to the

traditional approach and 20 participants to the video-module approach. The face-to-face session of instruction and demonstration provided by an appointed gynaecologist is considered the gold standard for procedural skill training related to IUD insertion. The participants from the traditional approach to teaching were exposed to this type of training and were used as the control group for this study. Alternatively, the intervention group had access to the online, video-module instruction. Only one practical session for performing the IUD insertion on a simulated patient was scheduled for both groups in accordance with the current practice of training.

The traditional training group received an initial five-minute orientation talk in regards to the purpose and expectations of the research study. After the introductory talk, the group was asked to answer the seven, short-answer questions pre-test that focused on the pre-procedure visit and post-procedure counselling of the patient. Once this was accomplished, this group was provided with a one-hour regular instructional session and IUD insertion demonstration, as it is usually performed during an IUD teaching clinic. An academic gynecologist involved specifically in this kind of training delivered the session, which consisted of verbal instruction and practice of the procedure with direct feedback. The verbal instruction was the same as the one that is imparted to the residents if they had attended a session at an IUD insertion clinic. The basic information about the device and the procedure was taught to the residents. The verbal instruction included topics such as the indications and contraindication of the procedure, characteristics of the device used, and the instructions and recommendations that should be given to the patient after the procedure. Once this part of the session was completed the residents were invited to move to the practice area. A table was set with three anatomic pelvic

mannequins specifically designed for teaching IUD insertion. In addition, residents were provided with IUD devices and procedure packages that included the surgical instruments and components needed to complete the procedure. Each of the residents performed the IUD insertion procedure on the pelvic mannequin while being guided by the Gynaecologist and received immediate feedback about their performance. Approximately 5 to 10 minutes were spent with each resident during this practice part of the instruction. The participants had the opportunity of ask questions during this part of the training and anytime during the verbal instruction session. After the training was completed, the participants were requested to write the post-test pertaining to the pre-procedure visit and post-procedure recommendations.

The conditions and environment of the IUD insertion clinic were reproduced, but instead of real patients, as previously stated, the demonstration and practice was delivered on pelvic anatomical models. The use of audiovisual aids in the form of cameras with overhead projection for close-up views of the demonstration were included to produce the same effect of a close anatomical view when performing the procedure on a real patient. The participants were allowed to interact as is regularly done during the IUD teaching clinic by asking specific questions, requesting clarification of specific parts, and with hands-on experience on the pelvic mannequins.

The video-module instruction group received the same initial five-minute orientation talk in regards to the purpose and expectations of the study. After the introductory talk each member of the group was asked to write the pre-test. Once this was completed, the group watched the instructional video-module. Although individual computer stations were not available for each resident, the video was presented to the

participants using an overhead projection. Nevertheless, the participants then had the option of reviewing specific parts of the video-instruction individually on a separate computer if needed to clarify any specific issues or concerns they had about the IUD insertion procedure. Once this was accomplished, the participants read the written materials as part of the video-module package that included: 1) An informed patient consent form, 2) a brief surgical description of the procedure and 3) a pre-procedure patient's questionnaire to guide the discussion with the patient.

The video-module shown to the participants was a nine and a half minute instructional teaching session on how to do an IUD insertion developed for the purpose of this study and can be made available for online use. The participants had 25 minutes to watch the video and review specific parts of it and 5 minutes to read the written materials. Once this part of the session was completed the residents were invited to move to the practice area. A table was set with three anatomic pelvic mannequins specifically design for teaching IUD insertion. In addition, the IUD devices and procedure packages that included the surgical instruments and components needed to complete the procedure were provided. Each of the residents performed the IUD insertion procedure on the pelvic mannequin while being guided by the instructor (academic family physician with experience in gynaecological procedures) and received immediate feedback about their performance. The participants had the opportunity of ask questions during this part of the training session. After the training was completed, the participants were requested to write the post-test pertaining to the pre-procedure visit and post-procedure recommendations.

After the training was completed, residents from both groups, performed an IUD insertion on a pelvic mannequin in the presence of an examiner (an academic family physician with experience in gynecological procedures) who had an IUD insertion competence checklist that included 27 items for assessment of the residents' performance (Appendix 4). During the performance of the procedure, the residents were asked to verbalize the actions they performed in the same manner they would have done during an Objective Structured Clinical Examination (OSCE) practical assessment. The scoring of each mark in the competence checklist was based not only on the completion of the tasks, but also on the adequate performance of each step as judged by the examiner. For instance, for the scoring item: "correct positioning for tenaculum clamping" adequate performance of the step was ensured by direct visualization by the examiner.

Once the learners completed the IUD insertion, participants from both groups were asked to complete a satisfaction survey. At the end of the session, the insertion competence checklists, all the questionnaires, and the satisfaction surveys were collected for analysis.

For the purpose of this training and study, the Mirena IUD insertion device was selected among the different IUD insertion devices available in Canada for two reasons: first, it is the IUD device considered to have the most complicated insertion technique due to the greater number of steps to be followed, and second, it is frequently used at most contraception clinics and family practice offices.

Examiner training

Ten academic family physicians with experience in IUD insertion participated in the study for the assessment of the IUD insertion. In order to assure consistency and to

standardize the assessment of the learners the examiners received written instructions on the use of the checklist and rating system, and information regarding the purpose and expectations of the study, at three weeks and one week before the study. The day of the study and prior to the activity, all the examiners received a 45-minute orientation session to review the characteristics of the study, checklists, scoring system, and the mechanics of the process. All of the examiners were blinded in regards to which group each participant belonged.

Description of the IUD video-module teaching intervention

For the purpose of this study, the author of this thesis developed a specific video-module to teach the IUD insertion procedure. The module includes an instructional video and brief written material that included: 1) an informed patient consent form, 2) a brief surgical description of the procedure and 3) a pre-surgical visit questionnaire to guide the discussion with the patient.

The video is a nine and a half minute instructional teaching intervention that was developed with the intention of providing specific instruction for the completion of an IUD insertion procedure successfully. The video was not a demonstrative video that illustrates only the performance of the procedure, as are many of the commercially available videos or procedural videos available on the internet, but instead was a comprehensive instructional video. This video not only complied with the principles for designing e-learning materials as delineated by Clark and Mayer in 2008,[18] but also provided clear practical information including demonstrations with four real patients and simulation models in order to present internal views that would not have been possible with real patients. It provided and specified in photos and short recordings clear

instructions about the correct and incorrect techniques for the procedure. It also sequentially illustrated the different steps for the procedure, providing summaries at different stages in the demonstration in order to consolidate the imparted instruction. Clear information bullets pertaining to the pre-procedure visit, preparation for the procedure and post-procedure advice were also included.

This video was intended to be watched twice by the learners and to return to specific moments in the video if any particular clarification was needed or if there was a need for any conceptual clarification. In this study, the learners interacted with the video-module on a designated computer, but for real life settings the video could also be accessible through a website link or in a DVD/CD form.

The written material part of the module included documents that are needed and are used in real life, but the three aforementioned documents were modified to be used as teaching materials, as they included teaching resources for the learner specific to the completion of the procedure successfully. These documents were:

1) The informed consent form:

This document was not the generic and standard form used regularly for any procedure. Instead, it was a specific form for IUD insertion that not only provides the required information for the patient, but also clearly lists the risks of the procedures, mentions its alternatives, states post-procedure advice, discloses some of the actions and symptoms during the procedure's performance and provides a clear definition of the procedure that residents sometimes find difficult to convey to the patient. If needed, this document can be used in real life cases (Appendix 5).

2) IUD insertion patient's questionnaire:

This was a document developed for this study comprised of 34 yes/no questions for the patient to answer independently while waiting to see the doctor, but it was also intended as a guide for the resident when interviewing the patient. This was a teaching resource that included questions in regards to the absolute and relative contraindications for the IUD insertion, general gynaecologic information and questions about general health status and allergies (Appendix 6).

3) IUD insertion procedure note:

This document briefly described each of the steps required for any standard IUD insertion as expected in any procedure note. It also presents a section to fill-in information that is important and required for the procedure, including different questions such as uterus position found by bimanual examination and date of last period. This document teaches and demonstrates the standards expected for this kind of procedural note and emphasizes on the questions and information that should be gathered as a condition to safely practice the procedure. This document is also intended for use in real patient situations (Appendix 7).

Description of the measurement instruments:

To evaluate the two IUD insertion instructional approaches used in this study, a pre-/post-test , a performance checklist and a satisfaction survey were used.

Pre-test

This was a 7-item assessment of participants' knowledge of the IUD insertion procedure that included short-answer questions to be asked before exposing the learner to the teaching activities. This pre-test assessed the pre-existing clinical knowledge in

regards to the procedural skill teaching and learning activity. The information asked in this test includes concepts necessary for the pre-procedural visit and for post-procedure recommendations. This questionnaire included enquiries about topics such as risks associated with the IUD insertion, alternatives to the procedure, contraindications, instructions for self-check after the procedure, medication administered before the procedure, and a follow-up patient visit schedule.

The first three questions (A1, A2 and A3) required participants to provide up to three written responses for each of the questions. The answers for these questions were scored on a scale from 0 to 2. If none of the written answers were correct, it was scored as zero. A score of one was assigned if one or two answers were correct, and a score of two was given if the three responses were correct. The two next questions (A4 and A5) required a short sentence response. A zero score was given if the answer was incorrect. A score of 1 was given if the answer contained partial information or if the answer was correct but it was not written in simple terms that a patient could understand. A score of 2 was given if the information was complete and it was written in terms that a patient could understand. The last two questions, each required a specific 2 or 3 word answer; if the answer was incorrect, zero points were given. One point was assigned if it was incomplete and 2 points were granted if it was correct. An example of the pre-test assessment questions is provided in Appendix 8.

Post-test

This was the same as the pre-test, but administered after the residents were exposed to the different instructional methods (Appendix 9). The post-test explored the knowledge and theoretical aspects related to the procedure, but in particular focused on the improvement

in knowledge achieved after the exposure to either method of instruction. This was scored in the same manner as the pre-test.

Performance checklist

The performance checklist sequentially assessed each step of the practical part of completing the procedure and was evaluated after the instruction (i.e., ability to perform a standard IUD insertion). This was a 27-item checklist that rated each item on a 3 point scale (yes, yes but, and no) based on the successful completion of the specific step during the procedure. If "no" was chosen by the examiner a score of zero was given; when "yes but" was selected a score of one point was given, and if "yes" was selected then a full two points were awarded. The maximum score possible on the IUD insertion performance checklist was 54. Each item was given the same value and no item was considered to be more important that another as the focus of the assessment was to rate the sequential performance of the procedure based on each item (Appendix 4). The Angoff's method for standard setting of checklist items was used for determining the minimum performance level (MPL) whereby each item was evaluated for the anticipated number (as a percentage) of minimally competent residents who should be able to correctly complete it. The mean MPL for each item was established by four academic family medicine physicians. The total MPL was set at sixty-five percent, hence, a learner was considered to have passed the procedure part if 18 or more items were achieved or performance correctly.

Satisfaction survey

This was a 15-item assessment tool that rated each item using a 5 point Likert scale (i.e.,1 = strongly disagree to 5= strongly agree) in which the participants from both groups rated

their level of satisfaction with the instructional method assigned to them (Appendix 10). The maximum score possible on the satisfaction scale was 75 and the minimum score was 15. The higher the score, the more the learner was considered to have had a good learning experience during the instructional activities used by each method. For the purpose of the analysis of this data, the scale was divided in 3 sections: a score between from 0 to 25 points was considered low, from 26 to 50 points was considered medium and from 51 to 75 points was considered high. The survey dealt mainly with the attitude towards the teaching experience and teaching environment; two questions focused on how confortable they felt in performing the IUD insertion and two on how confident in providing counselling about the procedure. At the end of the satisfaction survey there was a section to write specific comments giving the participants the option to add any further opinions they may have had about the instructional method used.

Evaluation of the Learner

Ideally any learner's competence should be evaluated in the cognitive, psychomotor and affective domains of learning.[36] The first two domains were evaluated using different assessment measures in order to investigate the impact that the two different instructional methods had on the ability of the learners to achieve the knowledge and skills required to complete an IUD insertion procedure successfully. The written pre-post-tests and post-test only performance checklists were intended to assess these two domains respectively, as the learning activities cannot be properly assessed by a single test format.[41]

The use of simulation was an aspect of the instructional methods involved in this teaching process, in particular, the use of pelvic models. This type of simulation allowed

a direct and specific evaluation of the knowledge and skills components, but obvious limitations existed in evaluating the attitudinal component (affective domain), as it was not possible to measure the attitudes towards a real patient. Nevertheless, to complement the assessment of the participants' attitudes toward the two instructional methods used in this study, the perspectives and opinions of the learners of the teaching experiences were measured using the satisfaction survey.

The methods used to obtain an objective evaluation of the aforementioned components included a short-answer question examination for the assessment of residents' clinical knowledge, a rating scale on specific items for the clinical skills (procedural skills performance checklist) and a 5 point, Likert scale for the assessment of participants' satisfaction with the instructional method assigned. As there were no instruments available to assess the resident's IUD insertion knowledge, skills or attitudes, the previously mentioned tests were developed by the author for the purpose of this study.

The construction of the short-answer questions and the rating scale was based on a specific table of specification related to the successful understanding and completion of an IUD insertion. As the short-answer questions assessed the clinical knowledge component, it included contents concerning the pre-procedure visit and post-procedure counselling. The visit prior to the procedure is where a physician obtains information from the patient to determine the suitability of the procedure, provides information to educate the patient about the procedure, and describes its characteristics and implications. The post-procedure counselling includes advice about the patient's self-surveillance following the insertion and follow-up arrangements. Despite the fact that the main purpose of any procedural assessment is its actual performance, the clinical knowledge component was

considered essential in the assessment of the IUD insertion performance. The design of the items for this questionnaire was aimed to include the knowledge, comprehension and application levels of the Bloom's taxonomy levels.[37]

The construction of the rating scale was intended to include the perception, set and guided-response levels from the Simpson taxonomy levels for psychomotor skill assessment.[38] In order to achieve a comprehensive assessment of the IUD insertion as a procedural skill, the short-answer question tests allowed for the assessment of the learners at the "knows" and "knows how" levels in the Miller's hierarchical pyramid[39] and the performance checklist permitted assessment of the learner at the "shows how" level. The "does" level could not be assessed in the frame of this study as this level of assessment requires performance of the procedure with real patients.

Information previously obtained about the instructional method.

In preparation for this study a "test of concept" pilot study was completed two years prior to this activity. It included 28 Family Medicine residents during their induction week just before starting the residency program. All of the participants were exposed to the video-module instruction and they later performed an IUD insertion in a pelvic mannequin in front of academic family physicians.

The results obtained using an author developed performance checklist, demonstrated that if the pass/fail level was set to 65% of correct items checked, 26 out of 28 residents (92.9%) successfully performed the procedure. If the pass/fail level was set to 80%, only 22 out of 28 (78.6%) reached the pass mark. The internal reliability coefficient obtained for the performance checklist at this time, using Cronbach's alpha, was found to be $\alpha = 0.81$.

Based on this previous experience a few changes were made to the checklist to fit with the structure of the current study: Firstly, in the pilot study the performance checklist included the open question part for the pre-procedure visit and the post-procedure counselling. For the present study, the evaluation tool was divided in two components (the short-answer question test and the performance rating scale). Secondly, the short-answer questions were optimized based on a table of specifications. Thirdly, in the pilot study the instructional intervention included only the exposure to the video-module without practice on a pelvic mannequin or feedback. These last two components (practice on a pelvic mannequin and immediate feedback) were added to the instruction of the intervention group in the current study in order to maximise the imparted teaching and also to be similar to the current academic practice options of the Family Medicine residency program at the University of Calgary. Fourthly, the instruction provided to the examiners was more comprehensive than in the "test of concept" session, as they received two written packages prior to the assessment day that provided them with more detailed explanations and allowed them more time to assimilate the concepts required for the evaluation.

Outcome Measures

The primary outcomes for this study were the differences in the short-answer question tests and in the performance assessment between the intervention and the control groups. Secondary outcomes included the similarities (correlations) and differences between the two groups on the results of the satisfaction survey, the results from the pre-/post-tests and total scores on the performance checklist based on age and sex of the participants.

Data analysis

For the comparison of the IUD insertion performance assessment, between group means differences were analyzed using independent samples *t*-tests. In order to determine the strength of the experimental effect the effect size was calculated using Cohen's *d*.[71] The interpretation of the magnitude of the effect size for both mean differences and correlations are based on Cohen's suggestions: $d = 0.20 – 0.49$ are "small", $d = 0.50$ to 0.79 are "medium", and $d \geq 0.80$ are considered to be "large" effect size differences.

The results of the procedural performance assessment were compared taking into account the sex and age of the participants using independent samples *t*-tests and a two-tailed bivariate Pearson's correlation analysis was also used to investigate the relationship between these variables on residents' performance. Scatter plot figures were used to illustrate the relation between variables.

Results of the pre-test, which reflects the participants' previous clinical knowledge about the IUD insertion procedure for the traditional instruction and video-module instruction groups, were compared using an independent samples *t*-test. In order to determine how knowledge was modified in each group after the intervention, paired *t*-tests were performed and the differences between means for each group were compared with the purpose of determining the true magnitude of the effect of the instructional methods. To determine the correlation between this variables, a two-tailed bivariate Pearson's correlation analysis was also used to look at convergent validity between measures.

For the satisfaction survey data, the results of the 15 items were compared using independent samples *t*-test. For contextual understanding of the practical magnitude of the differences, the values were converted to a percentage scale. A bivariate Pearson's

correlation was calculated to determine the relationship between performance and satisfaction for the whole group and separately for each instructional group. Scatter plot figures were extracted to illustrate the relationships. Because assessment tools were used for scoring the learners performance and their satisfaction of the teaching activity, Cronbach's alpha was calculated to determine their internal consistency. The computer program SPSS® version 19 was used to analyze the data. All analyses were two-tailed and p-values < 0.05 were considered statistically significant.

Chapter Four: RESULTS

This chapter presents the statistical analysis of the obtained results when comparing the two groups of learners that were exposed to either type of instruction: 1) conventional teaching session which includes direct instruction, demonstration, practice and feedback provided by a gynaecologist appointed by the University of Calgary for IUD training, and 2) exposure to the video-module instruction (with demonstration), practice and feedback.

The main focus of the present study was to assess the performance of the IUD insertion procedure after receiving the instruction. Clinical knowledge was also deemed important to be assessed, in particular in regards to the pre-procedure visit and post-procedure counselling. Both groups of learners were assessed on both components of the imparted training. The present chapter will introduce first the results of the performance of the procedure (motor skills), then the results of the clinical knowledge, and finally the results from the satisfaction survey.

From the total participants in the study (n = 39), 53.8% were males (n = 21) and 46.2% were females (n = 18). The participants' ages ranged from 23 to 38 years with a mean of 28.4 years. Nineteen of the Family Medicine residents were randomly assigned to the traditional instruction group and twenty residents to the video-module instruction group.

Procedure Performance

The performance was assessed and calculated using an insertion competence checklist (Appendix 4). To be successful in this evaluation, a passing score was set at sixty-five percent, which was determined by using the Angoff's method for standard

setting of checklists items. All of the participants in the study but one achieved a passing score.

The results obtained from the evaluation of the procedure's performance were analyzed first by comparing the mean difference between groups. The participants in the video-module instruction group obtained higher scores (M = 48.1, SD = 4.89) than the participants in the traditional instruction group (M = 43.8, SD = 6.42) (Table 1). An independent samples t-test analysis was used to compare the performance between the two groups. The intervention group was shown to perform significantly better than the traditional group, $t(37) = 2.37$, $p < 0.05$. Levene's test for equality of variances was not significant ($p > 0.05$) allowing the assumption of equal variances and homogeneity between the two groups.

Table 1. Summary of the Statistics for Procedural Performance Between Group A and Group B.

	Group A	Group B
Intervention	Teaching with a traditional instructional session	Teaching using Video-module Instruction
Number of participants	19	20
Mean (Percentage)	43.8 (81.1%)	48.1 (89.1%)
Standard Deviation	6.43	4.89
Standard Error Mean	1.47	1.09

Cohen's *d* was used as an effect size measure to determine the strength of the experimental effect (i.e. approach to teaching) on participants' performance. The effect size calculation between groups on the IUD insertion procedure was found to be supportive of the video module training with a medium effect size difference in comparison with the traditional training approach at $d = 0.75$.

It was not possible to conduct a pre-performance assessment of the residents' performance on a simulated IUD insertion procedure. Nevertheless, it was estimated that the best possible score that could be obtained by a resident without specific training on the IUD insertion procedure would be at 35 out of a total possible score of 54. Although this is believed to be an overestimate of their performance this corresponds to just below the minimum competence level of 65% before the teaching intervention was provided. The effect size calculation based on these assumptions determined that the traditional training intervention would have shown a large improvement ($d = 1.54$) as would have been the estimated effect for the video-module intervention group at $d = 2.30$ given they were able to perform at a minimal level.

For analysis of the procedure performance based on the sex of the participants an independent samples *t*-test was performed. When comparing the results among males and females it was found that the performance by males ($M = 45.4$, $SD = 7.57$) was similar to the performance by females ($M = 46.6$, $SD = 3.58$) and that there was no significant difference between the two groups $t(37) = 0.67$, $p > 0.05$.

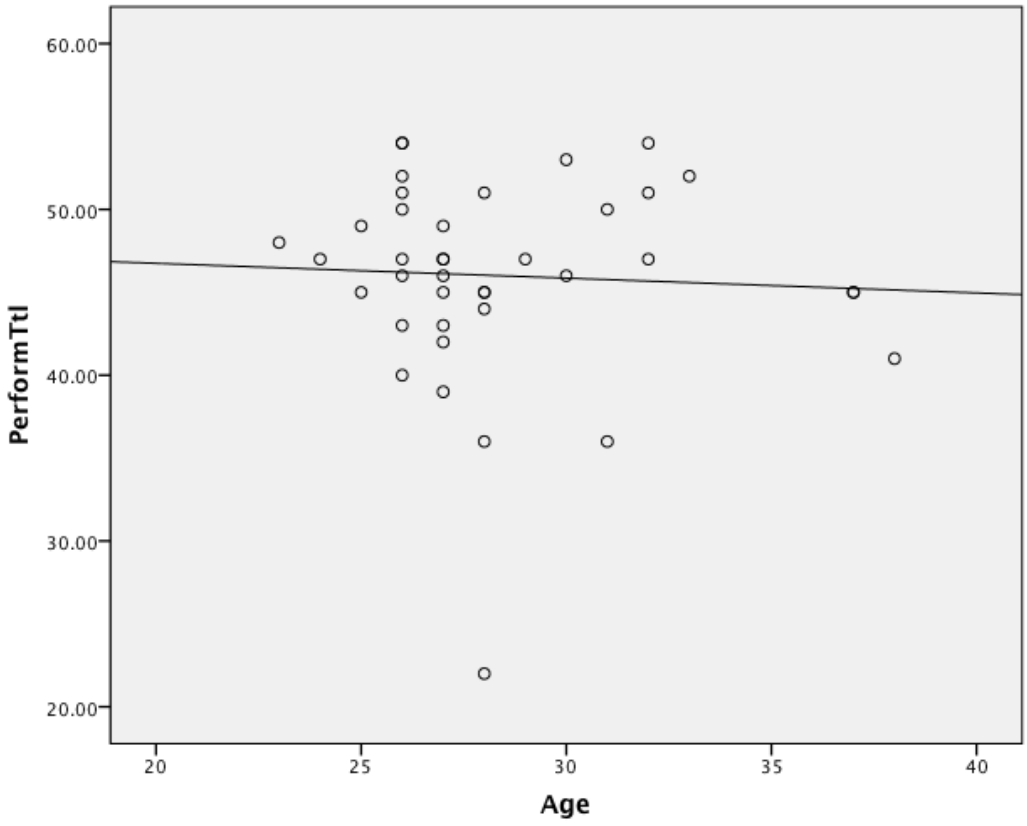
In order to compare the results for differences on the procedural performance based on different age categories, an independent samples *t*-test and a correlational analysis were performed. For the *t*-test, the participants were divided in two groups (ages

27 or less years, and 28 or more years). The results indicated that there was no significant difference on the procedural performance results among the age categories created, $t(36) = 0.91$, $p > 0.05$. As there was no specific hypothesis of what age category would perform better, a two-tailed bivariate Pearson's correlation was performed to investigate the correlation between age (as a continuous variable) and residents total performance score. It demonstrated that there was no significant relationship between age and performance on the IUD insertion procedure, $r = -0.05$ ($p > 0.05$).

A regression analysis was calculated on residents' performance on the IUD insertion (dependent variable) with their age and sex as independent variables. In the model, age accounted for 1.1% of the variance in predicting the residents' procedural performance; sex accounts for zero percent of the variance and both values are not statistically significant ($p > 0.05$).

Figure 1 illustrates a disperse scatter plot of the residents' scores around a best-fit line and illustrates that no significant relation exists between the two variables age and performance on the IUD insertion procedure.

Figure 1. Comparison of Age and Performance of the IUD Insertion Procedure



Based on these results, no significant differences were found on the IUD insertion performance by age or sex of the participants. In addition, within group analyses between age or sex were completed for both the traditional and video module groups. In only one case, there was found to be a statistically significant difference where females (M = 64.9, SD = 4.20) gave on average a higher satisfaction rating than males (M = 59.5, SD = 5.87) on the video-module training group, $t(19) = -2.29$, $p < 0.05$.

Pre-test and post-test performance

The results from the pre-test were analyzed initially between groups. The pre-test assessed previous clinical knowledge about the IUD insertion, in particular, what the

residents learned about the theory related to the procedure from medical school. An independent samples *t*-test was conducted to compare clinical knowledge between the two groups (traditional instruction and video-module instruction). The participants in the video-module instruction scored higher ($M = 9.0$, $SD = 2.33$) than the participants in the traditional instruction group ($M = 8.0$, $SD = 2.52$). The results showed that there was not a significant difference between the groups on pre-test scores; $t(37) = 1.35$, $p > 0.05$.

To compare the results from the pre-test to the post-test a paired-samples *t*-test was performed for each group to determine how the intervention influenced the knowledge within the groups. For the traditional group it was noted that the participants significantly improved from the beginning to the end of the study, pre-test ($M_1 = 8.0$, $SD = 2.52$) and post-test ($M_2 = 11.3$, $SD = 1.70$). The paired *t*-test for the traditional intervention group was $t(18) = 5.64$, $p < 00.5$, with $r = 0.53$. The group exposed to the video-module instruction also demonstrated a significant knowledge improvement, pre-test ($M_1 = 9.0$, $SD = 2.33$) and post-test ($M_2 = 12.3$, $SD = 1.87$). The *t*-test results for the video-module group were $t(19) = 6.92$, $p < 0.05$, $r = 0.51$.

The Pearson's Product Moment correlation coefficient (r) is frequently used to measure the strength of relationship between two variables, but this is also a very useful measure of the strength of an experimental effect.[65] For example in table 2, in regards to traditional teaching, we find that there is no significant correlation between post-test and performance of IUD insertion ($r = 0.31$, $p > 0.05$) and between satisfaction and performance ($r = 0.39$, $p > 0.05$). There was a negative correlation between satisfaction and post-test but it was also no statistically significant ($r = -0.15$, $p > 0.05$).

Table 2. Traditional Teaching Correlation between Test Measures (*n* = 19).

		Pre-test Total	Post-test Total	Performance Total	Satisfaction Total
Pre-test Total	Pearson Correlation	1.00			
	Sig. (2 Tailed)				
Post-test Total	Pearson Correlation	0.31	1.00		
	Sig. (2 Tailed)	0.19			
Performance Ttl	Pearson Correlation	0.38	0.31	1.00	
	Sig. (2 Tailed)	0.11	0.19		
Satisfaction Ttl	Pearson Correlation	0.34	-0.15	0.39	1.00
	Sig. (2 Tailed)	0.16	0.54	0.10	

*Correlation is significant at the 0.05 level (2-tailed)

In Table 3 it is appreciated that, in the video-module teaching group, no significant correlation was found between performance of IUD insertion and post-test ($r = 0.33$, $p > 0.05$), satisfaction and post-test ($r = 0.38$, $p > 0.05$) or satisfaction and performance ($r = 0.27$, $p > 0.05$).

Table 3. Video-module Teaching Correlation Between Test Measures (*n* = 20).

		Pre-test Total	Post-test Total	Performance Total	Satisfaction Total
Pretest Total	Pearson Correlation	1.00			
	Sig. (2 Tailed)				
Postest Total	Pearson Correlation	0.52	1.00		
	Sig. (2 Tailed)	0.02			
Performance Ttl	Pearson Correlation	0.01	0.33	1.00	
	Sig. (2 Tailed)	0.96	0.16		
Satisfaction Ttl	Pearson Correlation	0.00	0.38	0.27	1.00
	Sig. (2 Tailed)	0.99	0.09	0.25	

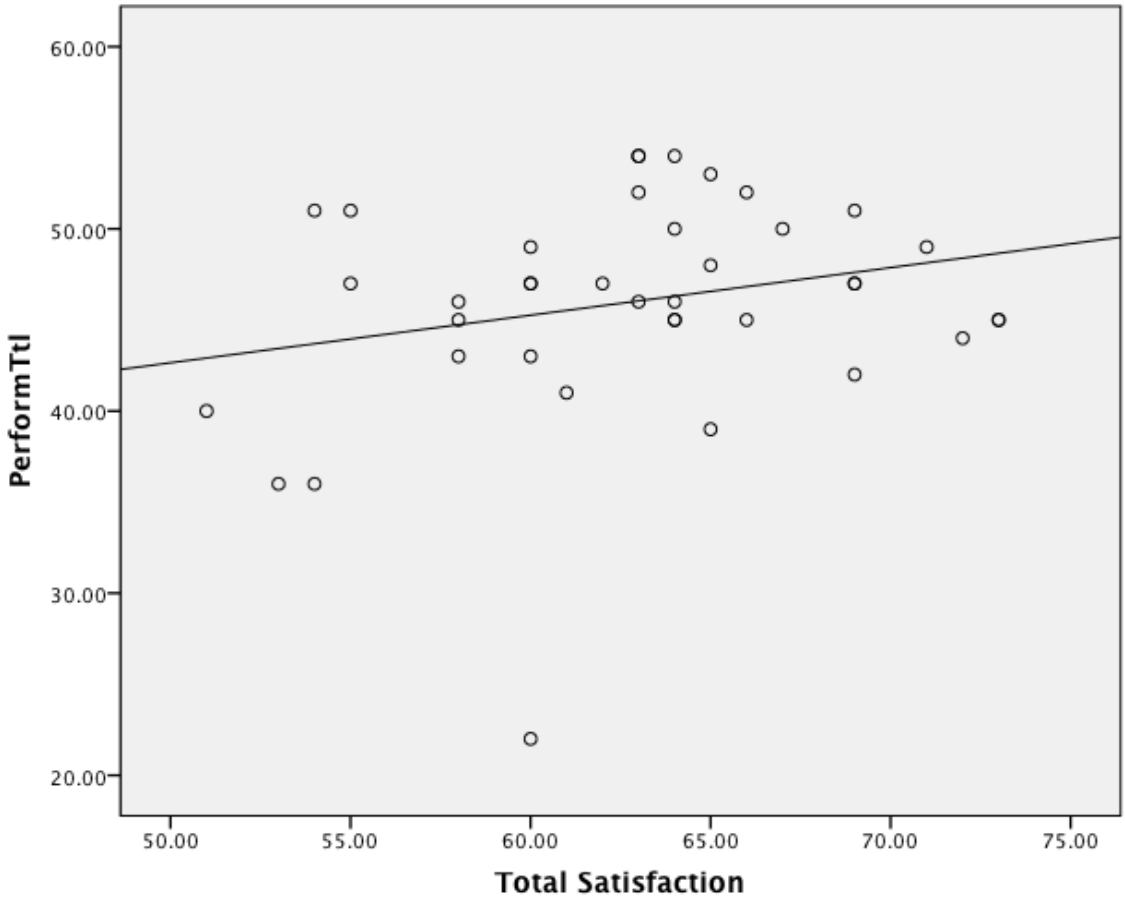
Correlation is significant at the 0.05 level (2-tailed)

Satisfaction Survey

The results of the satisfaction survey were analyzed by comparing the two different groups experiences of learning how to perform an IUD insertion. The opinions were gathered by a 15-item survey using a 5 point Likert scale (i.e., 1 = strongly disagree to 5 = strongly agree) with a maximum satisfaction score of 75 points. The traditional instruction group scored slightly higher (M = 63.7, SD = 5.48) than the video-module instruction group (M = 61.9, SD = 5.74). For the analysis of this data an independent samples t-test was performed demonstrating no statistically significant difference $t(37) = 0.99$, $p > 0.05$. When converting these results to a percentage scale, the traditional instruction group scored 85% satisfaction and the video-module instruction 83% satisfaction.

A bivariate Pearson's correlation analysis was performed to determine if any relationship existed between how well all the participants did on their performance and satisfaction scores in each of the two groups, $r = 0.39$, $p > 0.05$ in the traditional teaching (Table 2) and $r = 0.27$, $p > 0.05$ in the video-module instruction (Table 3). The scatter plot graphic (Figure 2) depicts the wide variance existent around the fit line and visualising no significant relationship between performance and satisfaction.

Figure 2. Comparison of Total Performance and Satisfaction



To further illustrate the relationship between performance and satisfaction scatter plot graphics for the correlation between performance and satisfaction for the traditional group (Figure 3), and for the video-module group (Figure 4) illustrate the results. In both groups the correlation, $r = 0.39$ for the traditional instruction and $r = 0.27$ for the video-module instruction, were not significant ($p > 0.05$).

Figure 3. Comparison of Performance and Satisfaction in Traditional Instruction

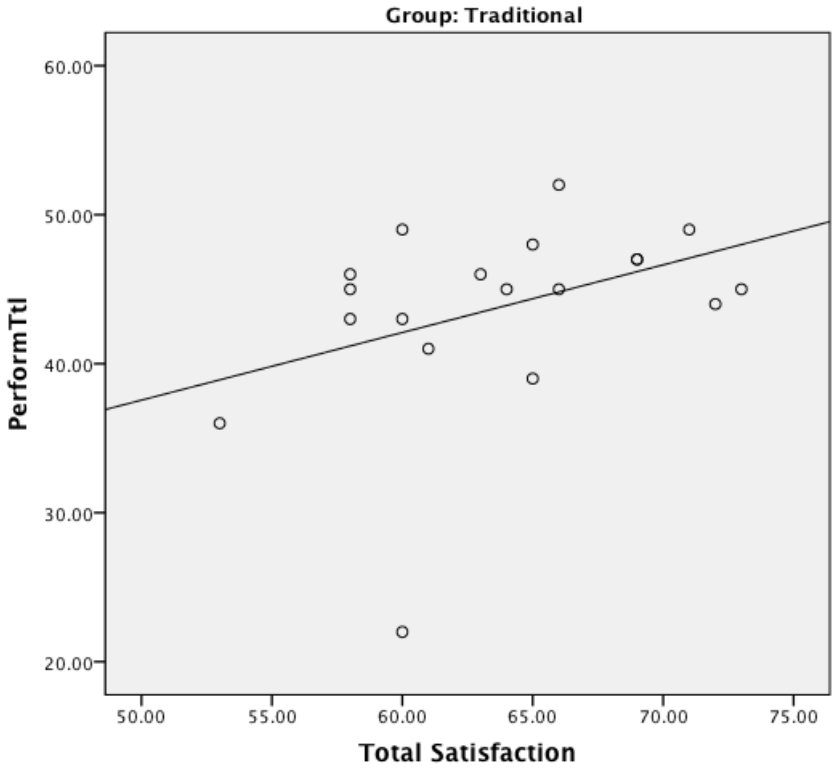
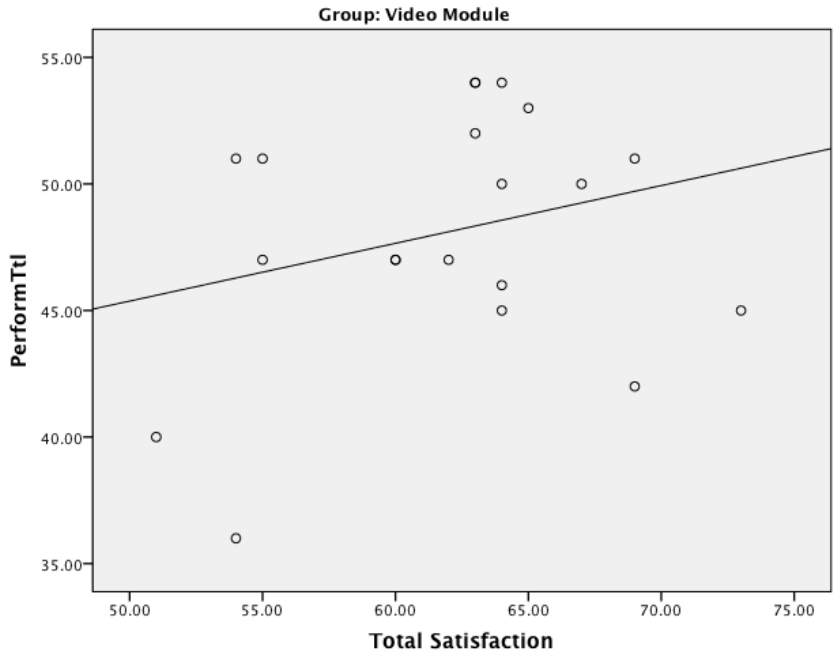


Figure 4. Comparison of Performance and Satisfaction in the Video-Module Group



The reliability coefficient for the Satisfaction Survey was found to be high at $\alpha = 0.83$. As shown in Table 4 the ratings by both the traditional and intervention groups were similar on each of the 15 items. Only questions 1 and 2 of the satisfaction survey assessed the residents' comfort levels to performing an IUD insertion. Although the obtained scores for question number 2 showed a small difference between groups, a *t*-test performed for this particular item showed no statistical difference, $t(37)$ 1.23, $p > 0.05$.

Table 4. Means (SD) of participant's responses to the Student Satisfaction Survey

	Traditional Group (n = 19) Mean (*SD*)	Intervention Group (n =20) Mean (*SD*)
1- I feel prepared to perform correctly an IUD insertion in a mannequin.	4.4 (0.68)	4.5 (0.69)
2- I feel prepared to perform an IUD insertion in a patient.	3.6 (0.50)	3.9 (0.67)
3- I feel prepared to provide counseling and advise about IUD insertion to a patient.	4.2 (0.37)	4.1 (0.83)
4- I found the instructional method efficient.	4.4 (0.61)	4.1 (0.69)
5- In general, I am satisfied with the overall instruction received in my training	4.4 (0.60)	4.2 (0.67)
6- The instruction received provided enough information to fully understand the procedure.	4.5 (0.51)	4.2 (0.67)
7- The visualization presented of the different procedural steps was very relevant.	4.6 (0.60)	4.4 (0.67)
8- I found valuable the information provided about incorrect procedural techniques	3.7 (0.88)	4.1 (0.76)
9- I found valuable the short summaries presented after each part of the instruction	3.9 (0.81)	3.8 (1.06)
10- The information provided (written or verbal) about indications and contraindications was clear.	4.5 (0.61)	4.3 (0.66)

	Traditional Group (n = 19) Mean (*SD*)	Intervention Group (n =20) Mean (*SD*)
11- The information provided (written or verbal) about risks to the procedure was clear.	4.5 (0.51)	4.3 (0.72)
12- The information provided (written or verbal) about post-procedure instructions was clear.	4.5 (0.61)	3.9 (0.99)
13- The time specifically spent during the instruction could adequately fit with the busy schedule expected for a Family Medicine resident during training.	4.3 (0.58)	4.5 (0.61)
14- I feel confident to counsel a patient about IUD insertion	4.2 (0.50)	4.2 (0.41)
15- I felt that the instruction I received was representative of dealing with a real patient situation.	4.0 (0.91)	4.0 (0.83)
Total	63.7 (5.48)	62.0 (5.74)

Reliability of the assessment tool

Cronbach's alpha was calculated to determine the internal consistency of the measures used for the IUD insertion study (i.e., pre and post-test written exams of clinical knowledge and performance checklist for procedure skill development, and residency satisfaction survey). The reliability coefficient for the Satisfaction Survey was found to be high at $\alpha = 0.83$. Table 5 reports the reliability for each of the assessment components.

Table 5. Internal Reliability Coefficient (Cronbach's α) for the IUD Insertion Assessment Measures (n = 39)

	Cronbach's Alpha	Number of Items/Questions
Procedure Performance Checklist	0.77	27
Pre-test	0.38	7
Post-test	0.51	7
Satisfaction Survey	0.83	15

Summary of the results

Looking at the results overall, one aspect of the present study was to investigate the difference obtained in clinical knowledge scores across pre and post-intervention in order to see if the participants improved their knowledge. Although both groups were found to improve significantly from pre- to post-test, there was found to be no statistically significant difference between the traditional and intervention groups on their post-test scores.

On the performance of the IUD insertion procedure, the video-module intervention group performed significantly better than the traditional intervention group. While both groups were determined to have performed well after the traditional and intervention teaching sessions, the effect size difference (Cohen' *d*) for the video-module group was found to be greater than the traditional instruction group at $d = 0.75$. No difference was found in performance in terms of sex or age. There was no significant difference in the

satisfaction scores between both groups and neither the traditional teaching or video-module groups were found to have statistically significant correlations between the measures Pre-test, Post-test, Performance and Satisfaction Survey (Tables 2 and 3).

The reliability obtained for the procedural rating scale suggests that is adequate for ongoing use in the evaluation of residents. The reliability coefficient for the Performance Checklist was $\alpha = 0.77$, and for the Satisfaction Survey was $\alpha = 0.83$. Both teaching methods were found to be reliable and valid. The obtained data indicates that the video-module teaching session is a potential method to supplement or enhance IUD insertion procedural training.

Chapter Five: DISCUSSION

This randomized, two group pre-/post-test (written) experimental research design focused on the comparison of residents' procedural skills performance (post-test only) based on an alternative instructional intervention (video-module teaching) with the traditional approach to teaching IUD insertion. The study used a systematic approach to prepare, develop, implement and evaluate a procedural skill instructional module that can be used as an alternative method for teaching IUD insertion skills with Family Medicine residents or to supplement existent methods. The local difficulties experienced by learners to obtain such training and for teachers to impart such instruction were taken into consideration to address the current situation.

The residents exposed to the video-module training were studied in comparison to residents exposed to the traditional method of instruction (teaching session provided by an appointed gynaecologist). The main assessment for comparison between the two instructional methods was their procedural skill performance as evaluated by experts on an IUD insertion checklist. For purposes of this study, the Family Medicine residents were novices to the practice of the IUD insertion procedure as they were invited to participate only if they did not have previous experience in performing this type of procedure. Moreover, the participants were first year residents that were recruited for the study during their induction period and before the formal residency training program had started in order to avoid any previous exposure to the performance of the procedure.

Assessment of performance

The main indicator of differences between the instructional groups in the IUD insertion procedure was based on the comparison in terms of the execution or

performance of the procedure. The higher performance checklist scores obtained by the group exposed to the video-module instruction suggested not only that the video-module teaching method was appropriate to impart the training and prepare the residents for the procedure, but also that the residents who were exposed to this teaching method performed significantly better than the traditional approach. In particular, the residents appeared to obtain greater gains in the knowledge needed to perform the procedure (i.e., 'knows how') than the group exposed to the traditional lecture-demonstration method.

Efforts were taken to avoid a "halo-effect" when examiners were selected to assess the participants' procedural performance in the study. During the Family Medicine residency, each resident spends two years in close contact with one to three assigned teachers and each resident is also involved in different learning and work-related activities that allow other teachers to know him/her very well. These characteristics of the residency training program could have influenced the scores of procedural performance given by the teachers, based on the performance the residents had during the daily practice and also in the personal characteristics and traits of specific residents. Due to the fact that none of the residents were known to the scoring teachers and that an objective, specific and sequential competence checklist was used for their performance ratings, the chances that the results could have been obtained due to other factors others than the correct performance of the procedure were decreased. In the same manner, the expert examiners were blinded to the kind of training that each resident had been exposed to, avoiding any possible bias towards either of the imparted teaching methods.

Having obtained the previously mentioned results for the IUD insertion procedure performance, it was important to determine the strength of the experimental effect to

establish whether one or both interventions were effective. For that purpose, a Cohen's *d* calculation to determine the mean effect size differences was used. The performance results between both groups after the training allowed us to determine how much more effective the intervention group (video-module instruction) was in comparison to the control group (traditional training). The effect size obtained was found to be a medium effect size difference at $d = 0.75$.

Another analysis to assess the effect size differences would have been to compare the results between groups with pre-procedure performance test data. The pre-test data, however, was not obtained because is was deemed unethical to expect learners without training to perform an IUD insertion and it was assumed that they would have not passed the minimum competency requirements based on the performance checklist assessment. Based on that assumption, the maximum score achieved by the participants would be at or just below the minimal performance level (MPL) cut-off score. In order to determine the effectiveness of the intervention, the pre-procedural performance test level was set at the MPL (65%), corresponding to 35 out of a total possible score of 54. After the teaching exposure, the mean score for the group that received training with the traditional instruction method was 43.8 ($SD = 6.43$) and for the group with the video-module instruction the mean score was 48.1 ($SD = 4.89$). Based on the pre-test assumption, the calculation determined that the traditional method has a strong effect size difference at $d = 1.5$ and that the video-module instruction method had a higher mean effect size difference at $d = 2.3$. Both interventions showed a large effect size difference, and as the effect sizes can be interpreted in terms of the percent of nonoverlap of the group's scores with those

of a pre-test or non-intervention group,[71] the traditional intervention group had a 73.1 % of nonoverlap and the video-module group 81.1% nonoverlap.

This calculation will allow not only to better understand the current results but also the eventual comparison of the results of this study with effect size differences of other scales of measurement of instructional methods used in procedural skill performances. The lecture and practice demonstration performed by an appointed gynecologist, which is the gold standard of instruction for the IUD insertion, has traditionally been used and accepted as a good and widely used method of instruction. The reported effect size difference suggests that the video-module instruction also qualifies as an appropriate and useful teaching method for IUD insertion procedure training of Family Medicine residents.

Based on the above, it can be stated that the difference observed between the two teaching method groups in regards to the residents' performance of the IUD insertion procedure (i.e., psychomotor skills) is statistically significant. In addition, as the mean effect size differences in both methods are large and demonstrates improvement and accomplishment in the procedural performance, it suggests that these findings will also meet the criteria to be clinically significant (i.e., improvement in clinical performance leading to better patient care and outcomes).

It was deemed appropriate to determine if any differences existed in the results based on the performance scores as a result of the age or sex of the participants. With regards to sex, it can be hypothesized that any difference found could have been due to the fact that this is a female contraceptive method and related knowledge could have been previously obtained by their exposure for personal reasons or out of particular interest.

Nevertheless, the results of an independent samples *t*-test analysis found that males and females performed equally well. In a linear regression analysis, sex was also found to be nonsignificant accounting for zero percent of the variance in residents' performance in the IUD insertion procedure. It was also deemed important to know if the age of the participants was associated with better results, but in independent samples *t*-test on the two different age groups identified demonstrated similar performance results (i.e., non-significant findings between groups) and a correlation coefficient of $r = -0.05$ demonstrated a non-significant relationship between these two variables.

The second comparison made between the groups exposed to the video-module and traditional training methods was the difference in the residents' clinical knowledge about the IUD insertion procedure. This part of the assessment targeted specifically the two components that complemented the practical performance of the procedure: 1) the knowledge that is necessary to provide accurate instruction to the patient about the procedure, which is transmitted to the patient during the pre-procedure visit, and 2) the clear instructions given during the counselling that happens directly following the procedure. The pre-test served to evaluate the previous knowledge that residents may have acquired during their undergraduate training previous to starting the residency, which very likely included the above-mentioned topics. The answers provided in the pre-test (written exam) indicated variable levels of knowledge in these topics that ranged from adequate to very limited, but in any case indicated some degree of exposure to this particular clinical knowledge. The obtained data also allowed us to determine if any major differences were present as a baseline between the intervention and control groups. Due to the fact that the participants were randomly placed into two groups, no difference

was expected or found. Although the data obtained showed that the participants of the video-module group started the study with higher scores on average, their results were not statistically significant.

For the written part of the assessment (pre and post-tests) a short answer question format was chosen. This kind of format was chosen to eliminate the possibility of guessing, which is inherent to a format that provides a list of possible answers to select from (e.g., multiple choice questions). This was considered important as it was likely that the learners had not had a recent gynaecology rotation that could have provided them with a recent memory of the practical and theoretical concepts related to IUD insertion. In particular, such facilitative testing could have produced an erroneous understanding or appreciation of their real pre-existing knowledge. In order to improve this evaluation, some of the questions initially contained in the first version of this test used in the "test of concept" study done in preparation for the current study, were rewritten or changed based on the feedback obtained from this previous experience, as verbalized by the learners and teachers. Constructing a response key to reduce subjective bias facilitated homogeneity in the scoring process with only one person involved in the scoring of these tests to ensure consistency.

Having obtained a base line of the pre-existing knowledge of the participants with the pre-test, it was important to determine how each groups knowledge had changed after the teaching interventions. The information obtained in the post-test helped quantify how the intervention modified the participant's understandings of the IUD insertion procedure in each of the two groups. The results showed that the participants in both groups significantly improved their scores in the previously mentioned subjects from the pre-test

period. When comparing the mean test scores obtained between the traditional instruction and the video-module groups, there was no significant difference. In the same manner, the pre-/post-test correlations for both groups were very similar (r = 0.53 and r = 0.51 respectively). Based on this data it is suggested that both instruction methods were effective in improving the knowledge of the participants, but there was no statistically difference between the methods when assessing their knowledge (i.e., 'knows') and potential to do (i.e., 'knows how') an IUD insertion.

Educational Methodology

The video-module instruction in this study follows traditional instructional principles that aim to produce an optimal learning scenario for the trainee. As previously discussed, in order to enhance the effectiveness of learning how to conduct a procedure scenario, the process should draw on concepts from different orientations of learning. The video-module training method intended to accomplish this goal. The initial part of the IUD insertion training modules incorporates a behaviourist approach in the sense that the learners initially adopt a passive role in the process, as there is a manipulation of the learning environment during the exposure to the video and the guided readings in order to impart the desired knowledge related to procedural skill. The process is followed by a simulation activity (IUD insertion in a mannequin), which is a controlled setting used to elicit a guided performance from the learners.

The video-module also incorporates elements from a cognitivist approach. During the instruction, the residents have to support their learning process not only in the immediate instruction, but also in the theoretical concepts acquired during medical school (which were determined in the pre-test assessment). The learner must make the

connections necessary to increase the understanding of the procedure and link it with the concepts, procedural instructions and motor skills learned during the video instruction and during the simulation. The video-module also intends to facilitate the acquisition and recall of ideas related to the procedure and based on this, use core concepts to provide correct instruction to the patient and guide the procedure.

From the constructivist point of view, the video instruction facilitates the active reflection over the content presented and the resident selects the relevant information to construct meaning from it and make the required decisions from which to guide the IUD insertion procedure; furthermore, at the end the practice, the resident receives feedback from the simulation performance from which to construct more personalized meaning from the training experience. Based on this constructivist approach, the initial use of the instructional video and the written material allows autonomy and is intended to provide residents with the ability to be self-direction (i.e., repeat specific sections of the video based on the resident's own needs, read the documents at his/her own pace). This will allow the residents to use it in any of the different learning settings to which they are exposed (during specific rotations, office based setting, hospital, especial unit, etc.).

Within the context of the social learning theory and being apprenticed by experienced clinicians, the resident initially learns the IUD insertion procedure by observation of the technique during the audio-visual instruction, this way the resident acquires and forms a representation of the modeled experience. Afterwards, the resident retrieves the stored images when he or she is motivated to act and in consultation with a preceptor, imitating them and reinforcing the skills by repetition during the simulation part of the learning experience. Moreover, the video-module is intended to provide the

possibility for private use, based on resident's time availability or when personal learning styles require reflexive instruction without active participation. This allows the resident to create the cognitive base that can be eventually used when the learner needs to apply the concepts and motor skills either by requirement from the preceptor, during simulation or when performing a real IUD insertion guided by the instructor.

From a humanistic orientation to learning perspective, the process of learning is achieved from a personal act to fulfil one's own potential and is based on self-initiated motivations. This method of learning allows the individual to be self-directed and autonomous in their learning process while the role of the educator is to facilitate the process. As the purpose of the present study was to allow learners to obtain the knowledge and skills to successfully complete the IUD insertion procedure at their own pace, and under their own autonomy based on the particular characteristics and constrains of the clinical setting of training, this self-regulated approach to instruction or training applies very well. As such, the initial part of training using the video-module instruction is based on a self-directed approach to learning by reviewing the video and supplementary documents to meet the residents' needs as learners.

The previous explanations in regards to the different learning theories and the teaching method used during the study illustrates how the video-module instruction intends to follow and integrate essential instructional principles from different learning processes in order to provide optimal instruction and maximise the learning experience.

Learning Environment

As described above, after exposure to the different instructional methods (video-module or traditional instruction) the residents demonstrated clinical knowledge gains at

different levels of Miller's pyramid. The pre-test, post-test and the verbal part of the simulative insertion performance assessed the knowledge ('knows') and competence ('knows how') levels, whereas the demonstration of the procedure in the mannequin assessed the performance ('shows how') level. The characteristics of the present study do not allow to assess the action ('does') level, however, if this tool is eventually used to instruct and evaluate the IUD insertion performance in real patients, as is frequently done in standard teaching conditions, the performance checklist could be used to assess clinicians in real practice. In particular, the performance checklist (assessment tool) is intended to be used in both simulation and real patient encounters.

The perceived quality of teaching activities reflected in the results from the satisfaction survey demonstrated a high satisfaction from the participants in both groups. Although not statistically significant, it was found that the group who underwent the traditional form of instruction rated this method higher for satisfaction than the other group. One could hypothesize that the reason for this result could possibly be the fact that traditional training involves instruction that is given face to face by a person instead of an interaction that is mostly through a video with written instructions.

For practical purposes, the residents' satisfaction scores were converted to a percentage. Although both groups rated their satisfaction with the training high (85% in the traditional instruction and 83% in the video-module instruction), the difference in the scoring was only 2% and not statistically significant. It was also pertinent to determine if there was a correlation between how the participants scored and how they rated their satisfaction, as participants who obtained a higher score could have also felt more

satisfied with the learning process. In the bivariate correlation analysis, however, no significant relationship between performance score and satisfaction rating was found.

The satisfaction survey assessed the residents' attitude towards the teaching environment they were exposed to and also their comfort levels of performing an IUD insertion. The residents felt equally comfortable in performing an IUD insertion in a mannequin as there was no statistically significant difference in scores for the traditional instruction group (M = 4.4, SD = 0.68) and video-module group (M = 4.5, SD = 0.69). When asked about the performance on a real patient (question number 2), the scores suggested that the group exposed to video-module instruction felt better prepared (M = 3.6 for the traditional and M = 3.9 for the video-module instruction group), but there was no statistically significant difference either, $t(37)$ 1.23, $p > 0.05$.

In general, the teaching experience was well valued by the participants. The findings from the satisfaction survey suggested that the residents were very appreciative of the learning experience by either of the two instructional methods. The information presented in the different areas was found valuable and the methods of presenting the information were perceived as efficient. It was reassuring to find that the subjective levels of preparedness in both groups for counselling patients and performing an IUD insertion on a mannequin were high. The fact that there were many requests to have more similar training sessions provided in the future indicates that residents valued the instruction on procedural skills and the environment was found conducive to learning. The written comments were also valuable as feedback for the whole process, in particular for improvement of the teaching experience, for future possible implementation of this method or for similar video-modules. Some valuable suggestions that could be used to

improve the teaching strategies included the addition of content on subjects such as “how to talk to the patient during the procedure” and “practice counselling with a patient”. The experience of performing the IUD insertion procedure on the mannequin in front of an evaluator was felt intimidating by some which is understandable as the learners had never practiced it before and indicates that the simulative experience was successful in representing some of the conditions of a real life scenario.

As the main purpose of the present study was to evaluate the video-module instruction, the feedback obtained is important for its improvement and the identification of required changes. The video used to impart the instruction was the fourth version as three other versions have been previously developed by the author and improved based on feedback obtained from teachers and academic staff. One of the features added to the initial versions were the summaries at the end of each section of the video. Comments obtained during this study such as “leave summaries at the end of the sections for more time” and to “change the color of the background in the summaries” tend to indicate that this specific feature received special attention and was appreciated by the learners. Different modifications were also made in the written material provided in the module; they were based on the same feedback obtained during the “test of concept” activity that was performed before this study.

The learning environment offered through the video-module aimed to offer a positive experience that could lead to appropriate knowledge gains on the topic area. As previously mentioned in this chapter, it was intended to provide conditions to allow knowledge acquisition in the different steps of Miller’s pyramid and also to include the perception, set and guided- response levels from the Simpson’s taxonomy levels for

psychomotor evaluation. The feedback obtained offers valuable information for continue improvement on the desired learning materials and environment.

Reliability and Validity of the measuring tools

The reliability coefficient (Cronbach's alpha) of the measurements was calculated to determine the internal consistency of responses to questionnaire items. The competence checklist developed to assess the IUD insertion procedure in this study had a reliability coefficient of $\alpha = 0.79$. Conventionally, a Cronbach's alpha value of $\alpha = 0.70$ is considered to be a satisfactory reliability coefficient for a OSCE checklist, adequate for a non-high stakes assessment[67] as well as a reliable scale in ability tests.[68,70] The results suggest that the items have relatively high internal consistency. The internal reliability coefficient for the satisfaction survey was also high at $\alpha = 0.83$.

In regards to validity, face validity was achieved by obtaining the opinion from four other medical teachers, asking them if the evaluating tools appeared to measure the intended aspects of the procedure. Content validity of the competence checklist and the written test was achieved by representing the contents of the blueprint developed based on the necessary instructional objectives required for completion of a comprehensive IUD insertion procedure. The learning outcomes identified for the assessment are traditionally based on the anticipated knowledge, skills and attitudes the learners are expected to achieve. The assessment performed focused on components of all three, as this type of intervention allows for all three to be evaluated. The written test (pre-test and post-test) focused on the clinical knowledge related to the IUD insertion as discussed previously in this manuscript, the checklist focused on the motor skills needed to perform the procedure, and the self-reported satisfaction survey allowed for us to determine what the

residents thought of the two different instructional approaches used to teach this procedural skill.

Goals and Objectives

The initial goal of this study were to determine the suitability of the video-module instruction method to provide Family Medicine residents with the needed knowledge, and skills to complete successfully the IUD insertion procedure, and to impart the knowledge needed to counsel the patient before and after the procedure. In part, one of the main objectives was to compare the results of using an alternative approach to teaching procedural skills with the current gold standard of care for the IUD insertion procedure (i.e., a session of instruction and demonstration provided by an expert gynaecologist). The results obtained have shown that the residents who were assigned into the video-module instructional method appropriately learned the motor skills required for the successful completion of the procedure and improved the clinical knowledge that allows them to properly counsel patients. Furthermore, this alternative approach to training procedural skills was comparable to the method traditionally used and appears to provide higher knowledge gain in the procedural part, than the gold standard. The last objective was to determine and compare how learners feel about the two methods based on a self-report satisfaction survey. The study determined that the residents' satisfaction was basically the same for both instructional methods, with all learners reporting a high degree of satisfaction.

Due to the fact that the development of the video-module instruction method was based on an identified expectation in the Family Medicine residency program, as well as on the practice need requirements of the residents, the results of this study are

instructionally meaningful and clinically significant. The previously described results and characteristics demonstrate that this alternative method of procedural skills instruction can provide a solution to some of the difficulties the Family Medicine residency program at the University of Calgary faces in delivering training to residents. This method is versatile and provides easier access for residents and reduced time for instruction by preceptors. Furthermore, it can be easily implemented in the different settings where the residents receive training including different teaching facilities such as clinics of community preceptors, offices in main teaching centres, and hospitals. The hands-on component of the video-module instruction can be delivered at convenient times for residents such us academic half days, during procedural skills workshops, regular teaching sessions, procedure clinics, as well as during busy clinical time when opportunity arises unexpectedly due to a scheduled patient's "no show" or at the end of a clinic. Although adequate instruction can be imparted with the video-module itself, the simulative element with a mannequin enhances the learning experience. The video-module offers the possibility of supplementing the instruction imparted in traditional ways when the procedure is taught on real patients. Implementation of the method is simple as the only requirement is to provide copies of the video-module, either by DVD, video CD or by internet access along with a pelvic anatomic model. The Family Medicine residency program has already shown interest in obtaining and delivering such simulation devices.

Based on the existing literature on this topic and the results of this study it can be concluded that the developed video-module instruction is an effective procedural teaching method for Family Medicine residents. Not only can these teaching materials be used to impart instruction, but also to support and complete the evaluative aspect of the training

(as the module includes the needed assessment measures), and to provide the grounds for more objective feedback. Finally, as this instructional method is simple to implement and use, other training programs or medical schools could utilize it if found adequate for their specific conditions and needs.

Limitations of the present study

Although this study was set-up as a randomized pre- and post–test experimental research design for the written component part of the assessment; a post-test only comparison between groups was established for the evaluation of residents' performance on the IUD insertion procedure. As stated previously, it was deemed unethical to request the leaners to perform the procedure without having the required motor skills training. Furthermore, when considering the possibility of such pre-test, it was also concluded that some logistical issues would have precluded its implementation as only one day was allowed for the session. Such issues included the limited number of skilled teachers with academic expertise in IUD insertion, and the difficulty in gathering them together more than once as they volunteered their free time away from clinical responsibilities and during a weekend. From the learners' perspective, it was difficult to find free time for this instruction during the very busy induction period's schedule, despite the fact of having had the session booked six months in advance. Once the learners had formally started their residency it would have been impossible to gather them together for this activity due to the scattered teaching locations and the time commitments imposed by the Master Schedule and the different rotations.

A second limitation was the number of residents involved in the study. Thirty-nine residents participated in the study; the total number of residents invited to participate

was seventy, from the urban stream of the program. The other program's stream is the rural part, which runs as a different program and has a completely different structure, administration and scheduling; for that reason it was not possible to recruit these potential participants. The residents were invited to participate voluntarily during three different occasions and using different methods (i.e., invitation letter, e-mail notifications, and personal invitation in front of the whole group). Reasons for the non-participation could have included the difficulties inherent to having just arrived in a new city, personal needs related to adapting to a new community during the first weekend after arrival, the volunteer participation nature of the study, or the lack of interest in receiving such training.

A third limitation of the study was that no real patients were used in the study. Due to ethical reasons and the need to protect the patient's wellbeing during this kind of study, only simulation methods of training were used, in particular anatomic pelvic mannequins. As time was also a limiting factor, multiple IUD insertion stations were not used in the assessment of procedural skill abilities (i.e., ability to handle less to more complex cases).

A fourth limitation could have been the possibility of own bias as the researcher of this study, an academic family physician involved in the residency program, and the developer of the video-module used for instructional intervention. In order to mitigate this bias, efforts and controls were introduced to avoid the researcher's direct influence during the preparation of the study, on activities during the day of the study, on the analysis of the data collected, and in the final writing of this thesis document. For instance, the contents of the conventional intervention during the planning phase were

kept in close similarity to the real conditions where they were usually performed based on the Gynaecologist needs and requests (e.g. setup for the conventional instructional sessions). In addition, the development of the assessment instruments were based on the expert opinion and input from four physicians with practice and expertise in IUD insertion from tables of specifications developed for this study. This ensured that objectively defined criteria was set for the scoring of the questionnaires and performance checklist and that the data collected was analyzed and findings reported under the guidance of an expert in measurement and assessment.

Conclusions

This study demonstrated that initiative and local efforts can produce specific and concrete solutions for areas in need in the Family Medicine residency training program. The video-module instructional method used in this study serves as an alternative approach for IUD insertion training and also as an example for possible similar modules that can help to provide the procedural skills training intended for Family Medicine residents. The measured effects of this instructional method make it suitable for imparting procedural skills (i.e., psychomotor skills) training and clinical knowledge that allow learners to perform the procedures safely in a simulated environment. Beyond that, the assessment instruments developed as part of the video-module may prove to be useful to guide and evaluate the IUD insertion procedure in real patients under supervised guidance.

The versatility of this kind of instructional method is expected to address some of the challenges that make procedural skills teaching difficult to obtain while allowing learners to access this knowledge and training in different circumstances, at their own

pace, as a part of drill exercises or under a preceptor's supervision. These modified approaches to providing procedural skills training can become the subject of future studies focused on addressing the interaction between video-modules and different learning styles. Due to the fact that this method of training has the objective of being used in different settings, future multi-centered studies can offer the possibility of deepening the understanding about this procedural training, improve its generalizability and provide information to improve the method, its teaching tools and the assessment tools used on it. Further studies could also be planned to address the subject of retention of the obtained knowledge and skills by performing a follow-up IUD insertion procedural assessment on the same group of residents at the end of their residency program or later once they begin their own medical practice.

While it is reassuring that the participants that used the video-module expressed their satisfaction with the interaction, method and the content of the assessment process, it addressed only one out of the multiple procedures that a Family Medicine resident is expected to learn. The development of a suite of video-modules could be another step to address this issue and to help implement the recent curricular changes in the post-graduate training programs. Further studies on similar procedural skills video-modules can broaden the evidence and knowledge of its effectiveness in providing alternative procedural training that ultimately benefits the both the residents and their patients.

REFERENCES

1- Lee D. Training to fit intrauterine devices/intrauterine systems for general practitioners: is there an alternative method of service delivery?. FFPRHC J. Fam Plann Reprod Health Care 2007;33(3).

2- Crutcher R. Szafran O. Woloschuk W. et al. Where Canadian Family Physicians Learn procedural Skills. Fam Med 2005;37(7):491-95.

3- Chaytors G. Szafran O. Crutcher R. Rural-Urban and Gender differences in procedures performed by Family Practice residency graduates. Fam Med 2001;33(10): 766-71.

4- Wetmore SW, Rivet C, TepperJ, Tetemichi S, Donoff M, Rainsberry P. Defining core procedures skills for Canadian family medicine training. Can Fam Physician 2005;51(10):1364-5.

5- College of Family Physicians of Canada. Defining competence for the purposes of certification by the College of Family Physicians of Canada: The new evaluation objectives in family medicine. 2010. Part II—Evaluation Objectives for daily use: the operation level, for assessing competence. Procedural Skills. Page 58. Available at: http://www.cfpc.ca/uploadedFiles/Education/Certification_in_Family_Medicine_Examination/Definition%20of%20Competence%20Complete%20Document%20with%20skills%20and%20phases.pdf. Accessed August 16, 2012.

6- Hammound M, Gruppen L, Erickson S, Cox S, Espey E, Goepfert A, Katz T. To the point: Reviews in medical education online computer assisted instruction materials. AM J Obstet Gynecol 2006;194 1064-9.

7- Valcke M, De Wever B. Information and communication technologies in higher education: evidence-based practices in medical education. Med Teach 2006;28 (1) 40-8.

8- Botezatu M, Hult H, Tessma MK, Fors U. Virtual patient simulation for learning and assessment: Superior results in comparison with regular course exams. Med Teach 2010;32 845-850.

9- Goertzen J. Learning procedural skills in family medicine: comparison of rural and urban programs. Can Fam Physician 2006;52:622–3.

10- Hubacher D, Vilchez R, Gmach R, Jarquin C, Medrano J, Gadea A, Grey T, Pierre-Louis B. The impact of clinician education on IUD uptake, knowledge and attitudes: results of a randomized trial. Contraception 2006;73 628-633.

11- Baraitser P, Herns M. Mock family planning clinics: community-based teaching on contraception for medical students. Med Ed 2001;35:1066-90.

12- Steinauer J et al. Training Medical School students in intrauterine procedures using papayas. Med Ed 2007;41:1083-11.

13- Neilsen et al. Evaluation of a clinical skills orientation program for residents. Am J Obstet Gynecol 2003;189(3):858-60.

14- Geyoushi B et al. Simulators for intimate examination training in the developing world. J Fam Plan Reprod Health 2003;29(1):34-35.

15- Limpaphayom K et al. The effectiveness of model-based training in accelerating IUD skill acquisition. A study of midwives in Thailand. Br J Fam Plan 1997;23:58-61.

16- Dent JA, Harden RM. A practical guide for medical teachers. 3rd ed. Churchill Livingstone: Elsevier; 2009.

17- Cwiak C, Edelman A, Hatcher R, Zieman M, Nichols M, Jensen J, Emmons S, Khan I. Teaching contraception: An interactive presentation using Managing Contraception. American Journal of Obstetrics and Gynecology 2004;191:1788-1792.

18- Clark C R, Mayer R E, e-Learning and the science of instruction. San Francisco: Pfeiffer; 2008.

19- Mayer RE. Multimedia learning. Cambridge: Cambridge University Press; 2001.

20- Akl MN. Giles DL. Long JB. Magrina JF. Kho RM. The efficacy of viewing an educational video as a method for the acquisition of basic laparoscopic suturing skills. J Minim Invas Gyn 2008;15(4):410-3.

21- Xeroulis GJ. Park J. Moulton CA. Reznick RK. Leblanc V. Dubrowski A. Teaching suturing and knot-tying skills to medical students: a randomized controlled study comparing computer-based video instruction and (concurrent and summary) expert feedback. Surgery 2007;141(4):442-9.

22- Nousiainen M. Brydges R. Backstein D. Dubrowski A. Comparison of expert instruction and computer-based video training in teaching fundamental surgical skills to medical students. Surgery 2008;143(4):539-44.

23- Thomas RE. Crutcher R. Lorenzetti D. A systematic review of the methodological quality and outcomes of RCTs to teach medical undergraduates surgical and emergency procedures. Can J Surg 2007;50(4):278-90.

24- Rogers DA, Regehr G, MacDonald J. A role for error training in surgical technical skill instruction and evaluation. Am J Surg 2002;183:242-5.

25- Rogers DA, Regehr G, Howdieshell TR, et al. The impact of external feedback on computer-assisted learning for surgical technical skill training. Am J Surg 2000;179:341-3.

26- Rogers PL. Jacob H. Thomas EA. Harwell M. Willenkin RL. Pinsky MR. Medical students can learn the basic application, analytic, evaluative, and psychomotor skills of critical care medicine. Crit Care Med 2000;28(2):550-4.

27- Rogers DA, Regehr G, Yeh KA, et al. Computer-assisted learning versus a lecture and feedback seminar for teaching a basic surgical technical skill. Am J Surg 1998;175:508-10.

28- Summers AN, Rinehart GC, Simpson D, et al. Acquisition of surgical skills: a randomized trial of didactic, videotape, and computer-based training. Surgery 1999;126: 330-6.

29- Carr MM, Reznick RK, Brown DH. Comparison of computer-assisted instruction and seminar instruction to acquire psychomotor and cognitive knowledge of epistaxis management. Otolaryngol Head Neck Surg 1999;121:430-4.

30- The college of Family Physicians of Canada. Triple C competence based curriculum. Available at: http://www.cfpc.ca/uploadedFiles/Education/_PDFs/TripleC_Report_English_w_cover_Sep29.pdf. Accessed August 20, 2012.

31- Gutkin C, Triple CNew competency-based family medicine curriculum, Canadian Family Physician 2011,57:856

32- The College of Family Physicians of Canada. CanMeds Family Medicine. Working Group on Curriculum Review October 2009. Available at: http://cfpc.ca/uploadedFiles/Education/CanMeds%20FM%20Eng.pdf. Accessed August 20, 2012.

33- The College of Family Physicians of Canada. Four Principles of Family Medicine. Available at: http://www.dfmqueens.ca/education/fourprinciples_pdfs/fourprinciples.pdf. Accessed August 20, 2012.

34- The college of Family Physicians of Canada. The new evaluation objectives in family medicine. Procedural skills. Page 62- 63. 2011. Available at: http://www.cfpc.ca/uploadedFiles/Education/Procedure%20Skills.pdf. Accessed August 9, 2012.

35- Wetmore SW, Rivet C, Tepper J, Tatemichi S, Donoff M, Rainsberry P. Defining core procedure skills for Canadian family medicine training. Can Fam Physician 2005;51(10): 1364-5.

36- Hopkins KD. Educational and psychological measurement and evaluation. 8th ed. Needham Heights, MA: Allyn & Bacon; 1998.

37- Bloom B, Englehart M, Furst E, Hill W, Krathwohl D. Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York: Longmans Green; 1956

38- Simpson E. The Classification of Educational Objectives, Psychomotor Domain. Illinois Teacher of Home Economics 1967; 10(4):121.126.

39- Kapfer M.B. Behavioural Objectives in Curriculum Development. Selected readings and Bibliography. 2nd ed. Englewood Cliffs, NJ; 1971.

40- Miller GE. The assessment of clinical skills/competence/performance. Academic Medicine 1990;65:563-567.

41- Wass V, Vand der Vleuten C, Shatzer J, Jones R. Assessment of Clinical Competence. The Lancet 2001;357:945-948.

42- Wellington J. Secondary Science: Contemporary Issues and Practical Approaches. New York, N.Y.: Routledge; 1994.

43- Jowati J. Simulation and learning theories. Academic Exchange Quarterly. 2006;10: 330-335.

44- Skinner BF. About Behaviourism. New York, N.Y.:Knopf; 1974.

45- Kim t, Axeirod S. Direct Instruction: An Educator's Guide and a Plea for Action. The Behaviour Analyst Today 2005;6 (2):111.

46- Ausubel DP. Educational Psychology: A cognitive View. New York, N.Y.: Holt, Rinehart and Winston; 1968.

47- Torre Dm, Daley BJ, Sebastian JL. Elnicki DM. Overview of current Learning Theories for Medical Educators. American Journal of Medicine 2006;119(10):903-907.

48- Collins A, Greeno JG, Resnick LB. International Encyclopedia of the Social and Behavioural Sciences. Pergamon, Oxford; 2001.

49- Grippin P, Peters S. Learning Theory and Outcomes. Lanham, MD: University Press of America; 1984.

50- Brookfield S. Becoming a Critically Reflexive Teacher. San Francisco, CA: Jossey-Bass, Inc., 1995.

51- Novak J, Gowing DB. Learning How to Learn. New York, NY: Cambridge University Press, 1984.

52- Kaufman DM. ABC of Learning and Teaching in Medicine. Applying Educational Theory in Practice. British Medical Journal. 2003;326:213-216.

53- Thomas P. General Medical Practitioners Needs to be Aware of the Theories on Which our Work Depend. Annals of Family Medicine 2006;4(5):450-454.

54- Whitney D. Throsten-Bloom A. The Power of Appreciative Inquiry. San Francisco. CA: Berrett-Koehler; 2003.

55- Whyte WF. Participatory Action Research. New York. NY: Sage Publications; 1991.

56- Torre DM, Daley BJ, Sebastian JL, Elnicki DM. The Reply. The American Journal of Medicine 2007;120(11):e13.

57- Miller NE.. Dollard JC. Social Learning and Imitation. New Haven. CT: Yale University Press; 1941.

58- Rogers CR. Freedom to Learn for the 80's. Columbus, OH: Merrill; 1983.

59- Bruner J. Toward a Theory of Instruction. Cambridge, MA: Harvard University Press; 1966.

60- Merriam SB. The New Update of Adult Learning Theory. New Directions for Adult and Continuing Educations No89. San Francisco, CA.: Jossey-Bass Inc; 2001.

61- Merriam S. Caffarella R. Baumgartner L. Learning in Adulthood: A Comprehensive Guide. 3rd ed. San Francisco, CA: Jossey-Bass Inc; 2007.

62- Kauffman DM. Applying educational theory in practice. British Medical Journal 2003;326:213-216.

63- Knowles MS. The Modern Practice of Adult Education. Englewoood Cliffs: Prentice Hall-Cambridge; 1970.

64- Knowles MS. The Modern Practice of Adult Education: From Pedagogy to Andragogy. Cambridge, MA: Cambridge Book Co.; 1988.

65- Field A. Discovering Statistics using SPSS. 3rd ed. London. SAGE Publications Ltd; 2009.

66- Rosnow RL, Rosenthal R. Beginning behavioural research: A conceptual primer. 5th ed. Englewood Cliffs, NJ: Pearson/Prentice Hall; 2005

67- Bland JM, Altman DG. Statistics notes: Cronbach's alpha. British Medical Journal 1997;314:572

68- Kline, P. The handbook of psychological testing. 2nd ed. London: Routledge; 1999.

69- Spearman C. Demonstration of formulae for true measurement of correlation. American Journal of Psychology 1907;18:161-169.

70- De Champlain AF. A primer on classical test theory and item response theory for assessment in medical education. Medical Education 2010;44:109-117.

71- Cohen, J. Statistical power analysis for the behavioural sciences. 2nd ed. Hilsdale, NJ: Lawrence Earlbaum Associates; 1988.

72- Lee JC, Boyd R. Stuart P. Randomized controlled trial of an instructional DVD for clinical skills teaching. Emergency Medicine Australasia 2007;19:241-245.

73- Bandura, A Social Learning Theory, Prentice Hall, NJ. 1977

74- Bandura, A. Self-Efficacy: Towards a unifying theory of behavioural change. Psychological review 1977;84:191-215.

75- Bandura, A. Human Agency in Social Cognitive Theory. American Psychologist 1989;44:1175-1184.

APPENDIX 1: The new evaluation objectives in Family Medicine

The College of Family Physicians of Canada

Procedure Skills

Certification for independent practice requires a certain level of experiential competence: this includes the technical skills to perform a certain number of procedures. Sixty-five core procedures are listed below, and these are the procedures upon which the assessment of competence will be based[8]. It should be remembered that it is not only the technical aspects of the individual procedures that are important. The higher levels of competence must also be assessed, as always, in the context of family medicine—the key features describe this aspect.

The General Key Features of Procedure Skills*

1. In order to decide whether or not you are going to do a procedure, consider the following:
   a) The indications and contraindications to the procedure
   b) Your own skills and readiness to do the procedure (e.g., your level of fatigue and any personal distractions)
   c) The context of the procedure, including the patient involved, the complexity of the task, the time needed, the need for assistance, and location
2. Before deciding to go ahead with the procedure:
   a) Discuss the procedure with the patient, including a description of the procedure and possible outcomes, both positive and negative, as part of obtaining their consent.
   b) Prepare for the procedure by ensuring the appropriate equipment is ready.
   c) Mentally rehearse the following:
      - The anatomic landmarks necessary for procedure performance.
      - The technical steps necessary in sequential fashion, including any preliminary examination.
      - The potential complications and their management.
3. During performance of the procedure:
   - Keep the patient informed to reduce anxiety.
   - Ensure patient comfort and safety always.
4. When the procedure is not going as expected, re-evaluate the situation, and stop and/or seek assistance as required.
5. Develop a plan with your patient for after care and follow-up after completion of a procedure.

* Apply to all procedures. These can be used to guide the development of specific evaluation tools for specific procedures.

---

[8] [8] Wetmore SW, Rivet C, Tepper J, Tatemichi S, Donoff M, Rainsberry P. Defining core procedure skills for Canadian family medicine training. Can Fam Physician. 2005; 51(10): 1364-5.

APPENDIX 2: The core procedures. The College of Family Physicians of Canada

Core Procedures

Integumentary Procedures
Abscess incision and drainage
Wound debridement
Insertion of sutures; simple, mattress, and subcuticular
Laceration repair; suture and gluing
Skin biopsy; shave, punch, and excisional
Excision of dermal lesions, e.g., papilloma, nevus, or cyst
Cryotherapy of skin lesions
Electrocautery of skin lesions
Skin scraping for fungus determination
Use of Wood's lamp
Release subungual hematoma
Drainage acute paronychia
Partial toenail removal
Wedge excision for ingrown toenail
Removal of foreign body, e.g., fish hook, splinter, or glass
Pare skin callus

Local Anesthetic Procedures
Infiltration of local anesthetic
Digital block in finger or toe

Eye Procedures
Instillation of fluorescein
Slit lamp examination
Removal of corneal or conjunctival foreign body
Application of eye patch

Ear Procedures
Removal of cerumen
Removal of foreign body

Nose Procedures
Removal of foreign body
Cautery for anterior epistaxis
Anterior nasal packing

Gastrointestinal Procedures
Nasogastric tube insertion
Fecal occult blood testing
Anoscopy/proctoscopy
Incise and drain thrombosed external hemorrhoid

Genitourinary and Women's Health Procedures
Placement of transurethral catheter
Cryotherapy or chemical therapy genital warts
Aspirate breast cyst
Pap smear
Diaphragm fitting and insertion
Insertion of intrauterine device
Endometrial aspiration biopsy

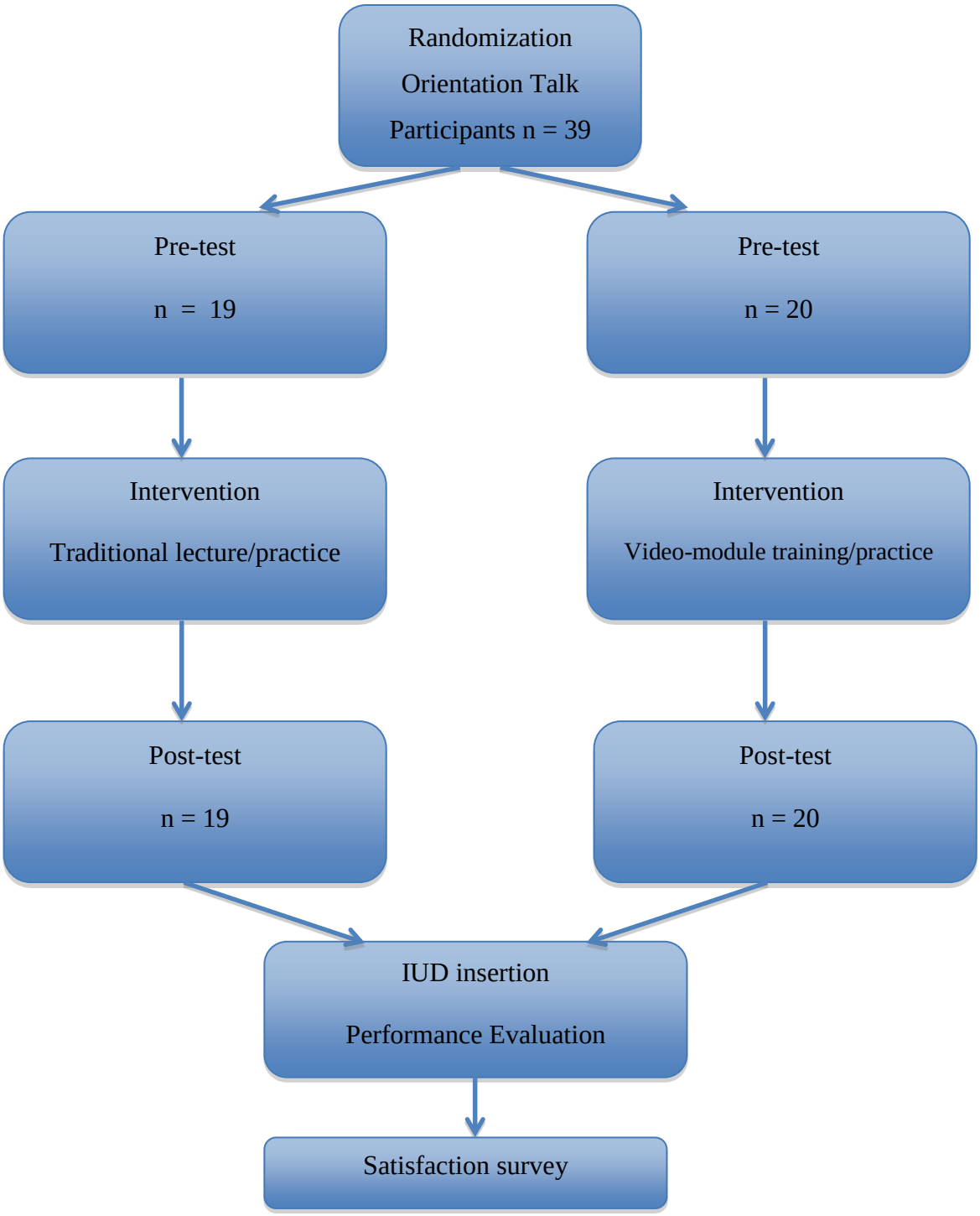
Obstetrical Procedures
Normal vaginal delivery
Episiotomy and repair
Artificial rupture of membranes

Musculoskeletal Procedures
Splinting of injured extremities
Application of sling—upper extremity
Reduction of dislocated finger
Reduce dislocated radial head (pulled elbow)
Reduce dislocated shoulder
Application of forearm cast
Application of ulnar gutter splint
Application of scaphoid cast
Application of below-knee cast
Aspiration and injection, knee joint
Aspiration and injection, shoulder joint
Injection of lateral epicondyle (tennis elbow)
Aspiration and injection of bursae, e.g., patellar, subacromial

Resuscitation Procedures
Oral airway insertion
Bag-and-mask ventilation
Endotracheal intubation
Cardiac defibrillation

Injections and Cannulations
Intramuscular injection
Subcutaneous injection
Intradermal injection
Venipuncture
Peripheral intravenous line; adult and child
Peripheral venous access—infant
Adult lumbar puncture

APPENDIX 3: Study Intervention Diagram



APPENDIX 4: Insertion Competence Checklist

B- Performance of the procedure

Please mark with an "X" your assessment for each specific step.

	Successful completion? →	NO	YES-BUT	YES
8	All the equipment needed is assembled	0	1	2
9	Sterile and non-sterile gloves are prepared	0	1	2
10	Bimanual examination is performed	0	1	2
11	States uterine size and position	0	1	2
12	Maintains field sterile field during scenario	0	1	2
13	Maintains IUD sterile during scenario	0	1	2
14	Ensure arms of IUD system are in horizontal position	0	1	2
15	System correctly inserted into the insertion tube	0	1	2
16	Threads fixed in the shaft's cleft	0	1	2
17	Gentle and appropriate speculum insertion	0	1	2
18	Cervix is centered and well visualized	0	1	2
19	Screened for signs of vaginal or cervical infection	0	1	2
20	Cleaning of cervix with antiseptic soaked sterile gauzes	0	1	2
21	Correct positioning for tenaculum clamping	0	1	2
22	Traction maintained for cervix stabilization	0	1	2
23	Correct gentle technique for uterine sounding	0	1	2
24	Correct hand holding position during sounding	0	1	2

25	Correct setting of flange to same depth measured by sound	0	1	2
26	Correct initial advance of IUD until flange is 2 cm away from cervix	0	1	2
27	Release of IUD arms and final advance of IUD	0	1	2
28	Removal of inserter without pulling IUD	0	1	2
29	Visualization of threads	0	1	2
30	Threads cut at a correct length	0	1	2
31	Atraumatic removal of the tenaculum	0	1	2
32	Inspection for cervical bleeding	0	1	2
33	Pressure applied for hemostasis	0	1	2
34	Removal of speculum	0	1	2

Yes = Successful completion of the specific step.

No = Unsuccessful completion of the specific step.

Yes-but = If you think that there was an incomplete attempt to perform the step that expresses some understanding but does not fully address the need of that particular step.

APPENDIX 5: Informed Consent Form

Informed Consent Form for IUD (intra-uterine device) insertion

Patient's Name:_____

Date: _____

1- I hereby authorize Dr. _____ to perform the procedure known as IUD insertion. In the event an anaesthetic or analgesic is needed, I consent to the administration of an anaesthetic or analgesic.

2- I have been explained that this is a procedure where **a thin plastic tube that holds the IUD is inserted into my uterus then, the IUD is opened and released inside my uterus**. I understand that it may be needed to dilate my cervix (the opening to my uterus) to pass the inserter into the uterus. I may also be given a medication called Misoprostol to help dilate the cervix before the procedure. I was explained that some cramping and discomfort could be associated with the IUD insertion.

3- It was explained to me and I understand that the IUD insertion is considered by some, as a micro-abortive procedure.

4- It has been explained to me that the procedure is generally safe, but that certain risks accompany any procedure. Risks of complications associated with IUD insertion biopsy include: Spontaneous **expulsion of the IUD** (that happens in 2 to 10% of cases), **infection in the uterus or nearby tissues**, **bleeding** for several days after the procedure, **pain and cramping, transient nausea, dizziness or faintness**, **perforation** (a hole in the uterus wall), **allergic reaction** to medications or instruments used, and **damage to an unknown pregnancy.** If I get pregnant having the IUD, I understand it can result in **ectopic pregnancy or miscarriage**.

5- I am aware that I could have **persistent spotting and cramping** for a few days after the procedure, but if these **symptoms are severe or discomfort is not alleviated by over the counter analgesics I should seek medical evaluation.** I have been advised and I have been instructed on how to **feel and check for the IUD threads** after the first menstrual period and monthly thereafter to ensure for correct IUD positioning.

6- I have been advised to avoid sexual intercourse for 1 or 2 weeks after the procedure to minimize the risk of Infection and other complications. I am well aware of the importance of a mutually **monogamous relationship** to decrease the possibility of infections or complications while the IUD is in place.

7- I understand that there are alternatives to this procedure, such as **oral contraceptives**, other hormonal contraceptives as **"the ring",** "**the patch**", the 3 **monthly injection, barrier methods** (male and female condom, diaphragm) and **the rhythm method**. I have been explained about the other alternatives and I have chosen the IUD insertion. I understand that I can refuse the procedure.

8- I have read this form and the information pamphlets given to me. I have had my questions answered to my satisfaction. I hereby release doctor my treating doctor, his nominees and assistants from any liability associated with this procedure.

Patient's Signature: _____

Date: _____

Witness: _____

APPENDIX 6: Patient's Questionnaire for IUD Insertion

IUD Insertion – Patient's Questionnaire

Please answer the following questions. This information will facilitate our discussion about this procedure.

Absolute contraindications for IUD insertion. Currently, do you have any: YES NO

1- Suspicion or certainty of you being pregnant?..... ( ) ( )

Ongoing Pelvic Infections:

2- Active sexual transmitted disease?..... ( ) ( )

3- Unpleasant or unusual vaginal discharge or itching (untreated cervicitis)?..... ( ) ( )

4- Diagnosis of infected Uterus during the last 3 months (Endometritis)?…….……..( ) ( )

5- Abnormal vaginal bleeding that your doctor is studying for possible cancer or pregnancy?.. ……..….( ) ( )

Have you ever been told that you have:

6- Abnormal shape of the uterus? (Significantly distorted uterine anatomy)…… …..( ) ( )

7- Large uterine fibroids?..... ( ) ( )

8- Pelvic tuberculosis?..... ( ) ( )

9- Infections of the uterus after deliveries or after miscarriages or abortions? (within 3 months)……... .( ) ( )

For specific types of IUD:

10- Known or suspected cancer of the breast?..... ( ) ( )

11-Liver tumor or acute liver disease (e.g. Wilson's disease)?..... ( ) ( )

12- Allergy to levonorgestrel (contraceptive hormone)?..... ( ) ( )

13- Allergy to cooper?..... ( ) ( )

Relative contraindications: Have you had:

14- More than 1 sexual partner in the last year?..... ( ) ( )

15- Sexually transmitted diseases during the last year?..... ( ) ( )

16- Problems with previous IUDs (perforation or significant pain)? ……...( ) ( )

17- Abnormal uterine bleeding which cause has not been found…… …… ( ) ( )

18- Immunodeficiency (Leukemia, uncontrolled diabetes, AIDS, cortisone medications)?..... ( ) ( )

19- History of fainting with medical procedures or when feeling anxious (vasovagal reactivity)?..... ( ) ( )

20- Anemia (thin blood)?..... ..... ( ) ( )

General questions: Have you ever had?:

21- Any ectopic pregnancy (Pregnancy in the fallopian tubes or outside the uterus? …….. ( ) ( )

22-Blood clots in you legs or lungs?..... ..... ( ) ( )

23- Frequent migraine headaches?..... ( ) ( )

24- Diabetes (abnormal persistent high sugar in your blood)?..... ( ) ( )

25- High blood pressure……. ( ) ( )

26- Coagulation problems (thin blood …..…….( ) ( )

27- Hereditary problems of coagulation?(Thick or thin blood problems in your family?)…….( ) ( )

Do you have any:

28- Unresolved abnormal PAP smear?(Abnormal Pap smear still in study).....( ) ( )

29- IUD that has not been removed?.....( ) ( )

30- Known intolerance to silicone, polyethylene?.....( ) ( )

31-Known cancer of the breast?.....( ) ( )

32-Artificial heart valves?.....( ) ( )

33- When was your last period?: _____

34- What is your current contraceptive method?:_____

Patient's Name: _____

Signature _____Date: _____

APPENDIX 7: IUD Insertion Procedure Surgical Note

IUD insertion - Procedure surgical note.

Patient name: _____

Date: _____ Age: _____

Type of IUD: _____

Date of last menstrual period: _____

Uterine position in the pre-procedure bimanual examination:_____

Procedure Description

The patient took or was offered, pre-procedure ibuprofen. After explaining the procedure, reviewing its risks, benefits and alternatives a written informed consent was obtained.

The patient was placed in the lithotomy position and a bimanual examination was performed to determine the uterine position. A sterile speculum was inserted, and the cervix was centered in the speculum. The cervix was sprayed with 20 percent Xylocaine solution. Sterile gloves were put on and the cervix was cleansed with povidone-iodine solution. The cervix was stabilized with a tenaculum placed on the anterior lip of the cervix. The sound was then placed to the fundus. The IUD flange was set to the obtained fundus measurement and the IUD device was set and prepared. The inserter was advanced through the cervix. The manufacture's standard steps for IUD device were followed to ensure correct positioning. Once the IUD was released, the inserter was withdrawn. The threads were cut leaving approximately 3 cm visible outside of the cervix. The tenaculum was removed, hemostasis was confirmed and the vagina was swabbed clear of blood. Final cleansing with Povidone-Iodine solution was done and the speculum was removed. The patient tolerated the procedure well. Remaining IUD threads

were shown and offered to the patient to feel for texture for comparison when she checks for intravaginal threads positioning. There were no complications during the procedure. She was requested to return for a post-procedure follow-up visit in 4 weeks or before as needed.

A Paracervical block was performed: Yes - No.

The cervix was dilated with Pratt dilators: Yes - No

Dr _____

Assistants:_____

_____

APPENDIX 8: Pre-Test Form

Resident IUD insertion – Short Answer questions. **PRE**

Name: _____ [ ]Male [ ] Female Age: _____

A1- Please list three risks associated with the IUD insertion that should be discussed with the patient before the procedure:

A- _____

B- _____

C- _____

A2- Please list three alternatives to the IUD insertion that should be discussed with the patient:

A- _____

B- _____

C- _____

A3- Please list three absolute contraindications for the IUD insertion.

A- _____

B- _____

C- _____

A4- Write the sentence you would use to describe the IUD insertion procedure to a patient?

_____

_____

A5- After the procedure, how do you instruct the patient to self-check for correct IUD positioning?

_____

_____

A6- When should the patient return for her first scheduled follow up appointment?

_____

A7- Name one medication that should be offered to the patient 20 minutes before the procedure:

_____

APPENDIX 9: Post-Test Form

Resident IUD insertion – Short Answer questions. **POST**

Name: _____ [ ]Male [ ] Female Age: _____

A1- Please list three risks associated with the IUD insertion that should be discussed with the patient before the procedure:

A- _____

B- _____

C- _____

A2- Please list three alternatives to the IUD insertion that should be discussed with the patient:

A- _____

B- _____

C- _____

A3- Please list three absolute contraindications for the IUD insertion.

A- _____

B- _____

C- _____

A4- Write the sentence you would use to describe the IUD insertion procedure to a patient?

_____

_____

A5- After the procedure, how do you instruct the patient to self-check for correct IUD positioning?

_____

_____

A6- When should the patient return for her first scheduled follow up appointment?

_____

A7- Name one medication that should be offered to the patient 20 minutes before the procedure:

_____

APPENDIX 10: Satisfaction Survey

Satisfaction Questionnaire

Name:_____ [ ] Male [ ] Female Age: _____

Based on the training you received today, on a scale of 1-5, with 1 being "strongly disagree" and 5 being "strongly agree," please indicate your response by picking the score that most accurately reflects your feelings about the following statements:

Please circle the appropriate:

I received instruction by: ( ) A- Video-module, ( ) B- Live orientation

Strongly Agree Strongly disagree

1- I feel prepared to perform correctly an IUD insertion in a mannequin.

1 2 3 4 5

2- I feel prepared to perform an IUD insertion in a patient.

1 2 3 4 5

3- I feel prepared to provide advice about IUD insertion to a patient.

1 2 3 4 5

4- I found the instructional method efficient.

1 2 3 4 5

5- In general, I am satisfied with the overall instruction received in my training.

1 2 3 4 5

6- The instruction received provided enough information to fully understand the procedure.

1 2 3 4 5

7- The visualization presented of the different procedural steps was very relevant.

1 2 3 4 5

8- I found valuable the information provided about incorrect procedural techniques.

1 2 3 4 5

9- I found valuable the short summaries presented after each part of the instruction

1 2 3 4 5

10- The information provided (written or verbal) about indications and contraindications was clear.

1 2 3 4 5

11- The information provided (written or verbal) about risks to the procedure was clear.

1 2 3 4 5

12- The information provided (written or verbal) about post-procedure instructions was clear.

1 2 3 4 5

13- The time specifically spent during the instruction could adequately fit with the busy schedule expected for a Family Medicine resident during training.

1 2 3 4 5

14- I feel confident to counsel a patient about IUD insertion.

1 2 3 4 5

15- I felt that the instruction I received was representative of dealing with a real patient situation.

1 2 3 4 5

Comments:

APPENDIX 11: Flow Sheet for Residents - Group A (Traditional Intervention)

General gathering at the main Theatre

General Instructions

↓

Answer the Initial written questions.

And give it to the attendant.

↓

Remain in the theatre and attend to the lecture by Dr. Lam

↓

COMPLETE the "**Resident Answers sheet" (White envelop)**

and put it back in the big envelop package

↓

PERFORM an IUD insertion in the anatomical model at the theater

↓

Leave the theatre. You will be guided to the Medical Skills Area (in front of the theatre) and you will be lead to the waiting area. **Then, you will perform the IUD in front of a reviewer.**

↓

When you finish: **KEEP THE IUD DEVICE** for you.

The attendant will give you a small insertion model to practice at home.

Before you leave please fill the Satisfaction Survey.

APPENDIX 12: Flow Sheet for Residents - Group B (Video-module intervention)

General gathering at the main Theatre

General Instructions

Answer the Initial written questions.

And give it to the attendant

You will be directed to the second theater. Once there:

1- WATCH DVD

2-READ informed Consent for sheet

3- READ IUD Insertion - Patient's Review Information Sheet

4- READ IUD insertion description

Once done: COMPLETE the "**Resident Answers sheet" (white envelop)**

and put it back in the big envelope package.

PERFORM an IUD insertion in the anatomical model at the theater

Leave the theatre. You will be guided to the Medical Skills Area and you will be lead to the waiting area. **Then, you will perform the IUD in front of a reviewer.**

When you finish: **KEEP THE IUD DEVICE** for you.

The attendant will give you a small insertion model to practice at home.

Before you leave please fill the Satisfaction Survey.

APPENDIX 13: Notes for the Learners Group A

1- This session is a focused training for the IUD insertion procedure.

2- Please answer the initial written questions when indicated.

3- You will attend a Lecture given by a Gynecologist, Dr. Gail Lam.

4- When the lecture has finished, you will be given an envelope with a question sheet on it. Please answer the questions and put the sheet back inside the big brown envelop. You then will practice the IUD insertion one time on a pelvic model.

5- Then, you will leave the theatre and you will be directed to the room where you will demonstrate what you have learned. When entering the door please give the envelope to the reviewer.

6- Treat the IUD insertion performance as real as possible.

7- This is not a quiz or an examination so relax, but give your best to the performance.

8- Talk through the process explaining what you are doing, similar to an OSCE.

9- You can only ask questions related to the dynamics of the procedure but not to the specific procedure, for example: "where can I turn on the light for this speculum?" or "Where are the sterile gloves?".

10- When you finish you will keep the IUD and you will be given a small device to practice at home. On your way out you will be asked to answer a short satisfaction survey.

Thank you very much for your participation. It is our hope that you have obtained an adequate understanding of this procedure.

APPENDIX 14: Notes for the Learners Group B

1- This session is a focused training for the IUD insertion procedure.

2- Please answer the initial written questions when indicated.

3- You will be transferred to another theater where you will be exposed to a teaching module.

4- When you have finished with the module activities you will be given an envelope with a questionnaire on it. Please complete the questionnaire and return it inside the big brown envelop. You then will practice the IUD insertion one time on a pelvic model.

5- Then, you will be directed to the room where you will demonstrate what you have learned. When entering the door please hand the envelope to the reviewer.

6- Treat the IUD insertion performance as real as possible.

7- This is not a quiz or an examination so relax, but give your best to the performance.

8- Talk through the process explaining what you are doing, similar to an OSCE.

9- You can only ask questions related to the dynamics of the procedure but not to the specific procedure, for example: "where can I turn on the light for this speculum?" or "Where are the sterile gloves?".

10- When you finish you will keep the IUD and you will be given a small device to practice at home. On your way out you will be asked to answer a short satisfaction survey.

Thank you very much for your participation. It is our hope that you have obtained an adequate understanding of this procedure.

APPENDIX 15: Participant's Consent Form

Research Project Title: Comprehensive Video-Module instruction an alternative for Teaching IUD insertion to Family Medicine Residents

Sponsor: University of Calgary

Principal Investigator: Dr. Tyrone Donnon

Co-Investigators: Dr. Juan Antonio Garcia-R. Masters student.

This consent form is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mention here, or information not included here, please ask. Take the time to read this carefully and to understand any accompanying information. You will receive a copy of this form.

Background

There are multiple difficulties to arrange the teaching of certain procedural skills to family medicine residents because of busy schedules, widely dispersed locations, and limited numbers of skilled faculty able to teach these procedures. Using video-module instruction is, therefore, an attractive alternative to traditional teaching methods. In this study, interested first year family medicine residents who have not had previous experience with IUD insertion will be randomly divided into two groups. One group will learn the procedure through a traditional demonstration/ lecture format, while the other group will learn the procedure mainly through a computer-based video-module instruction. After the

instruction sessions, both groups of residents will be asked to perform the procedure on a pelvic mannequin, and their performance will be assessed.

What is the Purpose of the Study?

The purpose of this study is to investigate the effectiveness of using video-module instruction to provide high quality IUD insertion training to Family Medicine Residents, in comparison to the traditional method of training.

What Would I Have to Do?

After you have read and signed the informed consent regarding your voluntary participation in this research study, you will be randomly assigned to a comparison group. Then you will answer a short pre-test.

Depending on which group you are assigned to, you would learn the IUD insertion procedure either by:

- Attending a lecture and demonstration.
- Watching a DVD module, and reading some written materials.

Once you have completed the training in whichever training group, you will be asked to complete a questionnaire to assess your knowledge of the procedure. In addition, you will be asked to perform the procedure on a pelvic mannequin in front of an assessor while describing your actions. Finally you will answer a satisfaction questionnaire.

What Are the Risks?

There are no greater risks to participation in this study than those ordinarily experienced in daily life. The scores obtained in this study are anonymous and will not have any effect in your residency marks.

Will I Benefit If I Take Part?

If you choose to take part in this study, you will have the opportunity to learn, by one of the two methods, about the theory and technique of IUD insertion. You will also have the opportunity to perform the procedure on a pelvic mannequin, and to receive feedback about your performance of the procedure.

From an educational perspective, the information we obtain from this study may help us to provide more effective teaching of procedures such as IUD insertion to family medicine residents in the future.

Do I Have to Participate?

Your participation in this research study is completely voluntary. You can refuse to participate or withdraw at anytime during the course of the study without retribution.

What Else Does My Participation Involve?

The data obtained from this study will be compiled into an aggregated format and published anonymous such that information from any one person will be kept strictly confidential.

Will I Be Paid For Participating, Or Do I Have to Pay For Anything?

You will not be paid for your participation and your involvement will not cost you anything more than the time that is required to complete the educational session and testing. At the end of the session, you will receive a device with which to practice at home.

Will My Records Be Kept Private?

The data will be gathered and processed in such a way as to ensure confidentially and complete anonymity by the principal Investigator. As such, each participant will be assigned an anonymous Study Identification Number, results will be presented in an aggregated format that will not identified any one person, and all of the research records obtained will be stored together and locked away in an office file cabinet at our facilities in the Health Science Centre. All data will be kept in a secured office inaccessible to others, and all of the collected paper copies and electronic records will be destroyed five years after completion of the study.

If I Suffer A Research-Related Injury, Will I Be Compensated?

In the event that you suffer injury as a result of participating in this research, no compensation will be provided to you by the University of Calgary, Alberta Health Services or the researchers. You still have all your legal rights. Nothing said in this consent form alters your right to seek damages.

Signatures

Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without jeopardizing your position or state of well-being. If you have further questions concerning matters related to this research, please contact:

Dr. Tyrone Donnon (403) 210-9682

Dr. Juan Antonio Garcia (403) 219-6128

If you have any questions concerning your rights as a possible participant in this research, please contact The Director of the Conjoint Health Research Ethics Board at the Office of Medical Bioethics, 403-220-7990.

1.1.1.1.1.1.1.1.1 Participant's Name	1.1.1.1.1.1.1.1.2 Signature and Date
1.1.1.1.1.1.1.1.3 Investigator/Delegate's Name	1.1.1.1.1.1.1.1.4 Signature and Date
1.1.1.1.1.1.1.1.5 Witness' Name	1.1.1.1.1.1.1.1.6 Signature and Date

The University of Calgary Conjoint Health Research Ethics Board has approved this research study. A signed copy of this consent form has been given to you to keep for your records and reference.

Signatures

Your signature on this form indicates that you have understood to your satisfaction the information regarding your participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the investigators or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time without jeopardizing your position or state of well-being. If you have further questions concerning matters related to this research, please contact:

Dr. Tyrone Donnon (403) 210-9682

Dr. Juan Antonio Garcia (403) 219-6128

If you have any questions concerning your rights as a possible participant in this research, please contact The Director, Office of Medical Bioethics, University of Calgary, 403-220-7990.

1.1.1.1.1.1.1.7 Participant's Name	1.1.1.1.1.1.1.8 Signature and Date

Investigator/Delegate's Name	Signature and Date
Witness' Name	1.1.1.1.1.1.1.9 Signature and Date

The University of Calgary Conjoint Health Research Ethics Board has approved this research study. A signed copy of this consent form has been given to you to keep for your records and reference.