ORIGINAL ARTICLE

## تقييم منهج دراسي تعليمي طُرح بغرض زيادة المهارة العملية في مجال المنظارالرحمي عند متخصصين النسائية والتوليد

**الهدف:** معرفة مدى تأثيرتعليم المنظار الرحمي على مجسم صناعي من اللاتكس من أجل زيادة المهارة الجراحية عند متخصصين النسائية.

**الطريقة:** تم تقييم ٧٤دكتور من متخصصين النسائية الذين اشتركوا في دورات تعليمية خاصة بالمنظار الرحمي في جامعة طهران للعلوم الطبية من عام ٢٠١٣إلى عام ٢٠١٥ وتم التعليم على شكل محاضرات، أفلام، مجسم الرحم والإشتراك في العمليات المباشرة. تم جمع معلومات الأطباء المشتركين في بداية ونهاية فترة التدريب و بعد ٦ أشهر من إنتهاء الفترة التدريبية وتم الحساب والتقييم لتأثيرهذه الدورة بطريقة ذاتية(subjective) وغير ذاتية (objective) على الأطباء المشتركين .

**النتائج :**كان ٨٧،٨٤ ٪ من الأفراد راضين عن الدورة التعليمية وقد ذكروا أن المجسمات أعطت عندهم حساً واقعياً عن جسم المريض. كان معدل علامات المشتركين بالدورة التعليمية ٧،٣ ±١،٧ . بعد ٦ أشهر كان التأثير الفعلي للدورة التعليمية على تطور مهارات الأفراد حوالي ٧٧،٠٣٪ . ولكن ٦٠،٨١٪ من المتخصصين لم يقوموا أو قاموا بعدد قليل من المنظار الرحمي و كان سبب ذلك في (٥٣،٢٢٪) من الحالات عدم وجود الإمكانيات اللازمة للتنظير. لقد تم تقدير التطور العلمي بشكل موضوعي للأطباء الذين كان إمكان القيام بالمنظار الرحمي متوفراً لديهم. وتبين أن٥٨،٧٪ من الأشخاص ازدادت مهارتهم في هذا المجال(p= ٠،٠٠٤) لقياس التأثير الذاتي و غير الذاتي للدورة التعليمية من حساب correlation بينهم (r=٠،٤٣ و p=٠،٠٠٣ ) أي أنه فقط في ٤٣٪من الأشخاص كان هذين التأثيرين متشابهين.

**النتيجة:** أكثر المتخصصين كانوا راضين عن الدورة التعليمية واعتقدوا أن هذا المنهج التعليمي كان مؤثراًعلى زيادة مهارتهم العملية .وحتى بعد مرور ٦أشهر كان نظر الأغلبية أن الدورة كان لها تأثيرها الإيجابي عليهم . على أي حال لأن أغلبية الأطباء لم يكن لديهم إمكانية القيام بالمنظار الرحمي لقد تم تقييم التأثير بشكل غير مباشر ومقايسته بالتأثير المباشر في عدد قليل من الأطباء لذلك من الممكن عدم وجود ارتباط بين هذين التأثيرين بسبب إنسحاب وقلة المشتركين في الدورات وليس بسبب عدم فائدة هذه الدورة التعليمية . لذلك يوصى قبل تغيير الطريقة التعليمية أن يتم إجراء دراسة مشابهة لهذه الدراسة بحيث تتضمن عدد أكثر من المشتركين.

**الكلمات المفتاحية:** المنظار الرحمي،التعليم، مجسم المنظار الرحمي،متخصصين النسائية،المهارات الجراحية ).

## Evaluation of Skill Assessment After Hysteroscopy Training Curriculum a designed

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**Background:** To evaluate a standard latex hysteroscopy model training course on gynecologists' surgical skills.

**Methods:** 74 gynecologists who attended to hysteroscopy training courses of the Training Centre, Tehran University, 2013 to 2015 were investigated. Theoretical information of trainees was obtained at the beginning, at the end and 6 months after the course by filling up a reliable and valid questionnaire. And its subjective and objective impact on their surgical skills and satisfaction were evaluated.

**Results:** 87.84% of participants were satisfied with the curriculum and for most of them, virtual uteruses were felt realistic. After 6 months, subject impact of the curriculum was 77.03%. But, 60.81% of gynecologists hardly could perform hysteroscopy, which was mostly due to lack of technology (53.22%). Objective assessment of surgical skills was done for those who could perform hysteroscopy. Of them, 58.7% had experienced a significant increase in their surgical skills ($p=0.004$). Correlation of subjective and objective impact of the curriculum was low ($r=0.43$), ($p=0.003$).

**Conclusion:** Hysteroscopy training program can improve gynecologists' hysteroscopic skills. The only index which is significantly correlated with the subjective impact of these courses is the number of previous operations. Also in Iran, because of lacking hysteroscopy equipment in most hospitals, the effect of training courses decreases after a while. So we recommend to train hysteroscopy in all medical universities and equip all hospitals with the hysteroscope. Also we suggest training courses for all gynecologists and repeated it every some years.

**Keywords:** hysteroscopy, education, hystero- trainer, gynecologist, surgical skill

## امراض النساء کے سرجنوں کیی مہارت بڑھانے کے لئے تیارشدہ ہیسٹروسکوپی کا جائزہ

**بیک گراونڈ:**اس تحقیق میں امراض النساء کر سرجنوں کو ہیسٹیروسکوپی کی تعلیم دینے کے اثرات کا جائزہ لیا گیا ہے۔ یہ ایک نیم تجربی تحقیق ہے۔

**روش:**امراض النساء کے جن چہتر ماہرین نے دوہزار تیرہ سسے دوہزار پندرہ تک تہران میڈیکل یونیورسٹی کے ہیسٹروسکوپی کے مرکز میں اس مہارت کی تعلیم پائي تھی اس تحقیق میں انکی مہارت کا جائزہ لیا گیا ہے۔ان ڈاکٹروں کو لکچر، اسائیڈ، فیلم، اور لائیو آپریشنوں کے ذریعے ٹریننگ دی گئي تھی۔ تحقیق کی ابتدا اور انجام پانے کے بعد نیز چھے ماہ کی ٹریننگ کے بعد ان کا امتحان لیا گیا اور آبجیکٹیو طریقے سے ہیٹیروسکوپی میں ڈاکٹروں کی مہارت کا جائزہ لیا گیا۔

**نتیجے:** ستاسی اعشاریہ چوراسی فیصد ڈاکٹروں نے ٹریننگ سے رضایت کا اظہار کیا ہے، ٹریننگ میں شرکت کرنے والوں کے اوسط نمبر ایک اعشاریہ سات سے سات اعشاریہ دو تھا۔ چھے مہینے کی ٹریننگ کے بعد مہارت کا ریٹ سستر اعشاریہ صفر تین فیصد تھا لیکن ساتھ فیصد ڈاکٹر ہیسٹروسکوپی انجام نہیں دیتے تھے کیونکہ ان کے پاس وسائل نہیں تھے۔اس بعد جن ڈاکٹروں کے پاس ہیسٹروسکوپی کے وسائل تھے ان کا آبجیکٹیو جائزہ لیا گیا۔ان میں اٹھاون فیصد ڈاکٹروں کی مہارت میں خاصہ اضافہ ہواتھا۔

**نتیجے:**اکثر ڈاکٹر ٹریننگ سے راضی تھے اور ان کا خیال ہے کہ تیار کیا گیا نصاب ان کے لئے مفید واقع ہوا ہے۔چھے مہینے کےبعد بھی انہوں نے کہا کہ ٹریننگ سے انہیں کافی فائدہ پہنچا ہے اسکے باوجود بیشتر ڈاکٹروں کے پاس چونکہ وسائل نہیں تھے لھذا ابجیکٹو اور سبجیکٹیو لحاظ سے موازنہ نہیں ہوسکا لھذا ان دونوں کی تاثیر میں ربط نہ ہونا کلینیکل ڈیٹا نہ ہونے کی وجہ سے ہے لھذا سفارش کی جاتی ہےکہ ٹریننگ کی روش تبدیل کرنے سے پہلے اسی طرح کی تحقیقات میزید ڈاکٹروں کے ساتھ انجام دی جائے۔

**کلیدی الفاظ:** ہیسٹیروسکوپی، ماہر امراض النساء، سرجری کی مہارت۔

## ارزیابی یک کوریلولوم آموزشی طراحی شده برای افزایش مهارت اعمال هیستروسکوپی در متخصصین زنان

**هدف:** ارزیابی تأثیر آموزش هیستروسکوپی توسط مولاژ استاندارد از جنس لاتکس جهت افزایش مهارت جراحی متخصصین زنان

**روش کار:** ۷۴ نفر از متخصصین زنانی که از سال ۲۰۱۳ لغایت ۲۰۱۵ در مرکز آموزش هیستروسکوپی (دانشگاه علوم پزشکی تهران) در دوره های آموزش هیستروسکوپی شرکت کرده بودند بررسی شدند. آموزش بصورت سخنرانی، اسلاید، فیلم، مولاژ رحم، و شرکت در عملهای live بود. اطلاعات افراد در ابتدا و انتها، و ۶ ماه بعد از دوره جمع آوری، و تأثیر سابژکتیو و objective دوره بر پیشرفت مهارت هیستروسکوپی افراد ارزیابی شد.

**نتایج:** ۸۷،۸۴٪ افراد از دوره آموزشی راضی بودند و از نظر اغلب آنها، مولاژها حس واقعی را القا می کردند. میانگین نمره شرکت کنندگان به دوره آموزشی ۷،۲±۱،۷ بود. پس از ۶ ماه، تأثیر سابژکتیو دوره بر پیشرفت مهارت افراد، ۷۷،۰۳٪ بود. اما ۶۰،۸۱٪ متخصصین هیستروسکوپی انجام نمی دادند و یا بندرت انجام می دادند که بیشترین علت آن (۵۳،۲۲٪) عدم امکانات بود. بررسی پیشرفت objective، در افرادی که امکان هیستروسکوپی برای آنها فراهم بود، انجام شد. در ۵۸،۷٪ افراد به طور معنی دار افزایش مهارت دیده شد ($P= 0.004$). برای مقایسه تأثیر objective با سابژکتیو دوره، با محاسبه Correlation بین آنها، $r= 0.43$ و $P= 0.003$ بود، یعنی تنها در ۴۳٪ افراد، این دو مشابه بودند.

**نتیجه گیری:** اکثر متخصصین از دوره های آموزشی راضی بودند و معتقد بودند که کوریکولوم بر افزایش مهارت آنها موثر بوده است. ۶ ماه بعد از دوره، باز هم از نظر اکثر آنها دوره ها بر مهارت آنها موثر بود. با اینحال، از آنجا که اغلب آنها امکان انجام هیستروسکوپی را نداشتند، بررسی تأثیر objective و مقایسه آن با تأثیر سابژکتیو، در تعداد کمی انجام شد. بنابراین شاید عدم ارتباط این دو تأثیر به دلیل ریزش نمونه ها بوده است نه ناکارآمدی روش آموزشی. لذا توصیه می شود قبل از تغییر روش آموزش، مطالعه مشابه با تعداد بیشتر شرکت کننده انجام شود.

**کلمات کلیدی:** هیستروسکوپی، آموزش، مولاژ هیستروسکوپی، متخصصین زنان، مهارت جراحی

## INTRODUCTION

Hysteroscopy is one of the common procedures in gynecology. However, it can have serious complications such as uterine and cervix perforations, resulting from blind manipulation or wrong use. The rate of major complications in hysteroscopy is 1%. It is, thus, of immense importance to improve the laparoscopic training in gynecologists in order to avoid these serious, even lethal complications [1]. There are some tools for this purpose, among which are in vitro simulators and modules [2].

Surgical training and skills acquisition can happen outside of the operating room to various degrees. It has been reported that surgeons can learn many fundamental skills and specific procedures with simulators. There is also evidence for the theory that those trained initially with simulators would perform better in the operating room in comparison to those who are not [3].

In the recent years hysteroscopy has become an irreplaceable procedure in gynecologic diagnosis and therapy. When using it as a diagnostic tool, the hysteroscope is inserted trans-vaginally with a 30 degrees optic. In the therapeutic setting, the resectoscope with a 12 degrees optic is used. The endoscopic intervention requires special surgical skills for endoscope handling and remote instrument control. Hands-on training in clinical praxis has become standard in order to acquire these skills, which has been reported to be correlated with higher risks for the patients [4].

This intensifies the needs for an urgent specific training to guarantee qualification of the surgeons [5]. The essential training program needs to be modern and low-cost. It would also be necessary that the potential trainees and trainers consider it as realistic and useful for the training of hysteroscopy [6]. Theoretical formation has to be consisted of a good knowledge of the material and its use: diameter and form of the operative channel, obliquity of the scope, liquid of distension and the kind of currency used [7].

The critical goal is to provide a realistic simulation which enables the trainees to actually augment their abilities in decision making and problem solving. Given this, the sense of presence is a critical factor to achieve the desirable training effect. Thus, it would be of immense importance to make the surrounding and interaction metaphors as same as during the real intervention [8].

Recent interactive computer technologies are influencing the medical education, training, and practice significantly. The newest innovation in computer technology, virtual reality, allows an individual to be immersed in a dynamic computer-generated, three-dimensional setting that can provide realistic simulations of operative tasks [9].

Wolfe et al. (1988) article was among the very first studies introducing a teaching model for endoscopic surgery: hysteroscopy and pelviscopic surgery. They argued that the tissue model can be manipulated so that the intraoperative conditions, similar to what gynecologic endoscopic surgery approaches, would be simulated. The importance of using the sow uterus and bladder is that it makes the tissue management possible in the instructional course. The student can learn where and how to remove tissue from the cavity, and to perform endoscopic techniques. The student can observe what happens to tissue under the influence of various energy forms such as bipolar or monopolar electrosurgery and lasers [10].

The purpose of this study was to evaluate the impact of hysteroscopy education by standard latex hysteroscopy model for assessment of gynecologists' surgical skills and develop an effective curriculum for training hysteroscopy.

## MATERIALS AND METHODS

This non randomize interventional trial was performed in Laparoscopy Training Center of Tehran University of Medical Sciences and Arash Hospital, which is affiliated by Tehran University of Medical Sciences (TUMS), from 2013 to 2015.

The training program was implemented in 3-day workshops, which were held consecutively. In each of the first 2 days, participants attended in 4 hour lectures. In the first day, the basics of hysteroscopy devices and media, its complications and methods of diagnostic hysteroscopy were taught by University staffs, using slide and videos. Participants were, then, introduced to the practical aspects of diagnostic hysteroscope, using virtual uteruses made of Wolfe Co. On the second day, different types of hysteroscopy including resectoscopy, were discussed using slides and videos and were then practiced on virtual models.

A real hysteroscope put into a sensor device that simulates movements with a 3D model of a uterus. The trainees, in this way, actually experience the concussion of a device against the uterine wall or the sensation of the resistance or the pull of a resectoscope when cutting a myoma in a virtual setting. The trainees experienced hysteroscopy in two types of modules. The first type was diagnostic hysteroscopy and some intrauterine conditions and procedures such as polyp resection using scissor. The next session, the trainees were introduced to resectoscope and how to resect a polyp, or myoma, and endometrial ablation.

In the third day, the trainees attended in the operative room of Arash Hospital of TUMS. The number and variety of surgeries performed there was so various that each of trainees could perform, at least, one diagnostic hysteroscopy and observe, at least, one of the various types of hysteroscopic surgeries. The training timing on the third day was 6 to 8 hours, depending on the number and types of surgeries.

The mean number of trainees in each workshop was 10, who were from all over the Iran. During these three years 7 workshops had been held and all of the attended gynecologists who were inclined to participate, entered the study.

All the participants had to fill a socio-demographic and professional questionnaire at the beginning of the workshop, and entered the study. The questionnaire was verified in the aspect of reliability and validity. At the end of training program, the participants were asked to fill a questionnaire in which their opinion about the quality of course and virtual models were asked. They were also required to rate the training course using a scale of 0 to 10.

Six months after finishing the course, the participants were contacted by phone and invited to participate in the post-

course evaluation. Those who were not inclined to participate and those who had incomplete data were removed from the study.

The participants were asked about the improvement in their surgical abilities in hysteroscopy (the number and quality of surgeries) and the impact of training course on their skills. The impact, of course, was categorized as "none", "poor" and "effective". Those who were not performing hysteroscopy had to explain why, they should choose one of the following: lack of technology, lack of self-confidence, lack of sufficient knowledge, and lack of patients.

To analyze the data, the degree of which each trainee estimated the training course had influenced her surgical skills was determined. The correlation of different socio-demographic factors with impact degree, were investigated. On the other hand the increase in the number of operations was determined in order to assess the objective impact of training programs in hysteroscopic skills of participants. Finally, the objective improvement, of course, was compared with what the trainees themselves believe.

All the data were analyzed using Statistical Package for Social Sciences version 16. Descriptive statistics were used to evaluate the data. Pearson Chi Square and McNemar's tests were used to compare the variables. The significance level was set at $p < 0.05$.

## RESULTS

During 2013 to 2015 seven training program were held and 86 gynecologists attended. 74 of them completed the data and entered the study. The mean age of participants were 42.6 (SD=5, min= 33 and max=56). 95.9 percent (n=71) of participants were female and 4.1 % of them were male (n=3). The shortest time has passed since graduation was one year and the longest was 25 years (mean=10.3, SD= 5.9). 43 of the participants (58.11%) had no experience of computer gaming, 28 (37.84%) were amateur and 3 (4.05%) were professional at cyber games. 43 (58.11%) of them were working in Tehran and the rest (41.9%) was occupying other cities of Iran.

20 trainees (27.03%) had an experience in hysteroscopy, and 54 of them (72.97%) had no experience. Among those gynecologist who previously performed hysteroscopy, 19 (95%) performed the level 1 hysteroscopy and only one participant (5%) performed a level-2 hysteroscopy.

42 (56.8%) of participants even had no experience of being an assistant in hysteroscopy operations. 23 (31.1%) experienced assistance for less than 10 times, 7 participants (9.5%) experienced it for 10 to 50 times and only 2 trainees (2.7%) had been assistant more than 50 times.

Of all the participants, 14 individual (18.91%) had been previously trained somehow about hysteroscopy, among whom 9 trainees (64.29%) had it during their residency and the rest had it after their graduation.

At the end of the program, participants were asked to rate the course and how the virtual models were felt using a scale of 0 to 10. The highest score was 10 and the lowest was 2 (mean = 7.2, SD=1.7). The results are shown in Table 1.

In the second part of the study, which was held six months later, the participants were asked that if they had performed hysteroscopy after the training program or not. Twenty-nine of them (39.19%) were performed hysteroscopy, 31 (41.89%) had not performed it at all, and 14 (18.9%) had been performing it rarely (less than once per month).

Among those 29 trainees who had been performing hysteroscopy, 22 (75.86%) had less than 5 operations per month, 5 (17.24%) had 5 to 10 operations per month, and two (6.9%) had more than 10 operations per month.

Of those who had not performed hysteroscopy or had done it rarely, the reasons were asked. The results are as follows:

(53.33%) Lack of technology

(33.33%) Lack of self-confidence

(4.45%) Lack of sufficient knowledge

(8.89%) Lack of patients

It shows that most common cause has been lack of required technology in the hospitals in which these gynecologists were working.

To assess the subjective impact of the training program on participant's hysteroscopy skills (regardless of whether they perform hysteroscopy), they were asked if the workshop had made any improvement in the abilities at hysteroscopy? Their answers were as follows: 51.35% answered "yes", 25.68% answered "a little" and 22.97% answered "No". The sum of

**Table 1. Evaluation of gynecologists of hysteroscopy training course**

| Opinions / Questions | Complete agree Number (%) | agree Number (%) | Without opinion Number (%) | Disagree Number (%) | Complete disagree Number (%) | Total Number (%) |
|---|---|---|---|---|---|---|
| Are you satisfied with the training course? | 27 (36.49) | 38 (51.35) | 8 (10.81) | 1 (1.35) | 0 (0) | 74 (100) |
| Was the diagnostic uterus model felt realistic? | 13 (17.57) | 33 (44.59) | 16 (21.62) | 11 (14.86) | 1 (1.35) | 74 (100) |
| Was the surgical uterus model felt realistic about grasping & cutting? | 13 (17.57) | 36 (48.65) | 13 (17.57) | 12 (16.22) | 0 (0) | 74 (100) |
| Was the uterus model felt realistic about resectoscopy? | 11 (14.86) | 28 (37.84) | 22 (29.73) | 12 (16.22) | 1 (1.35) | 74 (100) |
| Do you suggest the training course to other gynecologists? | 32 (43.24) | 30 (40.54) | 10 (13.51) | 1 (1.35) | 1 (1.35) | 74 (100) |

**Table 2. Assessment objective impact of hysteroscopy training course on gynecologists' surgical skill, who were able to perform hysteroscopy**

| Previous hysteroscopy / Surgical level | Performing Number (%) | Not performing Number (%) | Total Number (%) |
|---|---|---|---|
| Improved | 20 (43.48) | 7 (15.22) | 27 (58.70) |
| Not improved | 14 (30.43) | 5 (10.87) | 19 (41.30) |
| Total | 34 (73.91) | 12 (26.09) | 74 (100) |
| P= 0.004 (Mc Nemar test) | | | |

**Table 3. Comparing objective with subjective impact of hysteroscopy training course on gynecologists' surgical skill, who were able to perform hysteroscopy.**

| Impact rate / Impact kind | Effective Number (%) | Not effevtive Number (%) | Total Number (%) |
|---|---|---|---|
| Subjective impact | 36 (78.26) | 10 (21.74) | 46(100) |
| Objective impact | 27 (58.70) | 19 (41.30) | 46 (100) |
| Spearman Rank Correlation test (P=0.003, R= 0.43) | | | |

those who themselves believed the program was useful for them (those who answered "yes" and "a little") showed that these training programs had caused a (significant or trivial) improvement in the hysteroscopy abilities of 77.03 % of participants.

To objectively assess the improvement in the hysteroscopy skills of trainees, those who were not able to perform hysteroscopy (due to lack of technology or case) were excluded. For others, changes in the level of hysteroscopy operations, before and after the training program were considered as an index of evaluating the impacts of the workshop. The results are shown in Table 2. Based on these data, the training programs had improved the objective hysteroscopic skills of 58.7% of participants, which was significant according to Mc Nemar test ($p=0.004$).

The objective impact was, then, compared with the subjective impact (Table 3), using the Spearman Rank Correlation test ($r=0.43$ and $p=.003$). It showed that only in 43% of participants, the subject and objective impact were similar.

Finally the relationship of socio-demographic indices and the subjective impact of training programs were investigated, using the Pearson's Chi Square test. The results showed that the only index which was significantly correlated with the subjective impact was the number of previous operations ($p=0.004$). The other parameters (age, experience of computer gaming, an experience of performing hysteroscopy, an experience of being assistant) had no significant impact on participant's skills (Table 4).

## DISCUSSION

In this study, we used a standard latex hysteroscopy model for practical training of hysteroscopy. In different studies, different methods have been applied. In different studies, different methods have been applied.

The Hystero Trainer is designed to simulate in vitro training for diagnostic and operative hysteroscopy [1]. The Hystero Trainer provides the opportunity of training of the entire spectrum of hysteroscopic procedures such as electrosurgical applications and also for a security check of the complex hysteroscopic device. Exactly therefore, this technique can help surgeons to face with real serious complications in a virtual setting [11].

Task specific hands-on training programs, that are brief and repetitive, have been shown to be facilitated for achieving short-term gains in learning operative hysteroscopy and increased the dry lab skill level. Rackow et al. (2012) argued that deliberate practice can augment the hysteroscopy skills in residents of obstetrics and gynecology [12].

Muller-Wittig (2001) developed the La Hystrotrain and reported the evaluations of this complex training system for hysteroscopy [4].

Bajka et al (2008) studied the face validity and realism and training capacity of Hyst Sim. Hyst Sim is a new virtual-reality simulator for the training of hysteroscopic interventions. Although the authors reported that it is a realistic and useful tool for the training hysteroscopy, however, further systematic validation studies are needed to clarify how this system can be optimally integrated into the gynecological curriculum [6].

Harders et al. (2006) simulated an operating room in their lab that provided standard hysteroscopic devices for interaction, and produce a new virtual scene for every session. It was a highly-realistic, immersive training environment for hysteroscopy [8]. Van Blaricom et al. (2005) designed a new curriculum for hysteroscopy training followed by an objective structured assessment of technical skills (OSATS). It was a fruitful way to grant knowledge and skill in the assembly and use of the operative hysteroscope [13].

**Table 4. Investigation the relationship of socio-demographic indices and the subjective impact of hysteroscopy training programs on gynecologists' surgical skill.**

| Kind of indices \ Subjective effect | | Effective Number (%) | Not effevtive Number (%) | Less effective Number (%) | Total Number (%) | P value |
|---|---|---|---|---|---|---|
| Computer gaming | Not performing | 22 (29.73) | 11 (14.86) | 10 (13.51) | 74 (100) | 0.7 |
| | performing | 16 (21.63) | 6 (8.11) | 9 (12.16) | | |
| Age | < 40 years | 12 (16.22 | 6 (8.11) | 8 (10.81) | 74 (100) | 0.2 |
| | 40- 50 years | 24 (32.43) | 10 (13.51) | 9 (12.16) | | |
| | > 50 years | 2 (2.70) | 0 (0.0) | 3 (4.05) | | |
| Performing hysteroscopy | Not performing | 23 (31.08) | 13 (17.57) | 17 (22.97) | 74 (100) | 0.065 |
| | Performing | 15 (20.27) | 4 (5.41) | 2 (2.70) | | |
| Previous hysteroscopy number | ≤ 5 in month | 15 (75) | 1 (5) | 1 (5) | 20 (100) | 0.004 |
| | > 5 in month | 0 (0) | 2 (10) | 1 (5) | | |
| Previous training course | Negative | 10 (13.51) | 1 (1.35) | 1 (1.35) | 74 (100) | 0.5 |
| | Positive | 5 (6.76) | 2 (2.70) | 1 (1.35) | | |
| Previous hysteroscopy residency (number) | Never | 18 (24.32) | 11 (14.86) | 13 (17.57) | 74 (100) | 0.56 |
| | < 10 | 15 (20.27) | 3 (4.05) | 5 (6.76) | | |
| | 10- 50 | 4 (5.41) | 2 (2.70) | 1 (1.35) | | |
| | > 50 | 1 (1.35) | 1 (1.35) | 0 (0) | | |

Pearson's Chi Square test

Voss et al (2000) proposed LAHYSTOTRAIN intelligent training system for laparoscopy and hysteroscopy. It was a computer-based simulator for training and objective assessment of surgical skills in laparoscopy and hysteroscopy which was developed using Virtual Reality (VR), Multimedia (MM) technology, and Intelligent Tutoring Systems (ITS) [5]. Aydeniz B. et al (2000) presented a simulation of hysteroscopy which offered an anatomically and physiologically realistic setting for training [2].

Levy J. S. (1996) developed a new virtual reality hysteroscope passing through a sensing device that synchronizes movements with a three-dimensional model of a uterus [9].

In this study, 95.9% of participants were female, which is due to legal issues in Iran that only permit to females to study gynecology since 30 years ago. There was no significant correlation between the age of participants and the impact of training program on their skills and no significant correlation were detected between computer gaming and the degree of impact. Workplace of 58.11% of trainees was located in Tehran. This may be due to the easier transportation for Tehran's residents. It also can be a result of more equipped hospitals of Tehran that provide the technologies necessary for hysteroscopy, and thus, requires the gynecologists to learn the essential skills.

In our study, only 27% of trainees had an experience of hysteroscopy before, and 95% of them could perform the level 1 hysteroscopy. There was no correlation between the previous experiences of hysteroscopy and the degree of objective impact on participant's skills. However, since the $p=0.067$ and these experiences were correlated with the subjective impact of a training program for those who had performed hysteroscopy ($p=0.004$), this can be due to our small sample. In fact, those who had performed more hysteroscopic operations before the workshop reported a more significant improvement in their skills.

Most of the trainees had no experience of assisting in hysteroscopic surgeries before, and among others, the majority had less than 10 experiences. There was no significant correlation between having an experience of assistance and the subjective impact of training programs on participant's skills.

Of all the participants, only 18.91% had been trained on hysteroscopy, most (64.29%) of whom had it during their gynecology resident ship.

At the end of the course, 87.84% of participants were satisfied. For most of them the virtual models felt like real, and the majority of them said that they would have recommended it to others. Finally the participants' mean score to the training program was 7.2 ($SD=1.7$).

Six months after finishing the workshop, only 39.19% of participants had been performing hysteroscopy. Among these had not performed hysteroscopy or had been doing it rarely, the most reported cause was the lack of technology and equipment in their workplace. 77.03% of participants reported that the training program had improved their skills significantly or trivially (subjective impact).

In objective assessment, the improvements of hysteroscopic skills, the training program had significantly improved the hysteroscopic skills in 57.8% of trainees.

Finally the objective and subjective impact of those performing hysteroscopy were compared, and a significant difference was detected ($r= .043$, $p=0.003$). This can be attributed to the different samples used for assessment of subjective and objective improvement.

Goff et al. 2007 compared the objective, structured assessment of technical skills with a virtual reality hysteroscopy trainer and standard latex hysteroscopy model. They concluded the VR Hysteroscopy Trainer is not superior to standard models for evaluating surgical skills [14].

This study emphasizes on the careful refinement and further testing of metrics before using it as an assessment tool for operative skills [15].

Practical formation could be done at once with virtual models to get used with the manipulation of the scope and thanks to the use of different currents with the assistance of a trained surgeon [7].

Successful completion of academic and practical work allows nurses to practice diagnostic hysteroscopy independently [16].

## CONCLUSION

The Hystero Trainers provide the opportunity of training of hysteroscopic procedures and can help surgeons to face with real serious complications in a virtual setting. In our study, most of the participants reported that the training program had improved their skills significantly or trivially (subjective impact), significant improvement the hysteroscopic skills in 57.8% of trainees, and improving the objective hysteroscopic skills of 58.7% of participants. So, the participants were highly satisfied with their training program.

The results showed that the only index which was significantly correlated with the subjective impact was the number of previous operations.

In other hand, most of the trainees had no experience in hysteroscopy surgeries before, and among others, the majority had less than 10 experiences. Also, six months after the workshop most of the participants had not been performing hysteroscopy or did it rarely, the most reported cause was the lack of technology and equipment in their workplace. During the six month follow up, since most of them could not perform hysteroscopy (due to lack of equipment), the objective assessment of hysteroscopic skills was done for only a few of them.

So we recommend to train hysteroscopy in all medical universities and equip all hospitals of Iran with the hysteroscope. Also, we suggest training courses for all gynecologists and repeated it every some years.

At the end, it is strongly recommended to conduct similar studies with more participants and various training methods, in order to design the most effective and most efficient curriculum for hysteroscopy training in developing countries.

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### Disclosures

The authors declare that they had no financial interests related to the material in the manuscript.

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