

## Bringing Colposcopy into Focus: A Multidisciplinary Curriculum for Residents

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Received Date: January 25, 2015 Accepted Date: April 1, 2015 Published Date: April 18, 2015

Citation: Veronica Lerner(2015) Bringing Colposcopy into Focus: A Multidisciplinary Curriculum for Residents. J Womens Health Gyn 1: 1-6

### Abstract

**Objective:** Appropriate training in colposcopy for residents is essential to improve management of abnormal cervical cytology and histology and reduce unnecessary testing and procedures.

**Materials and Methods:** A colposcopy curriculum including multidisciplinary colposcopy conferences, weekly small-group didactic sessions and hands-on procedural training was introduced into an obstetrics and gynecology residency curriculum. Third and fourth year residents participated in colposcopy clinics as part of their routine clinical experience. Residents completed the American Society for Colposcopy and Cervical Pathology (ASCCP) Resident Assessment of Competency in Colposcopy exam prior to and after initiation of the curriculum. Resident scores were analyzed based on year of training and attendance patterns. Residents also completed a survey about their subjective experience of the curriculum.

**Results:** Nineteen residents participated in the curriculum over two years and completed ASCCP exam at baseline and two years later. Eight residents attended at 5 or fewer small-group didactic sessions (low-attendance group), and 11 residents attended 6-13 sessions (high-attendance group). Residents in high-attendance group had an improvement in their overall score at the follow up exam (+8.7%,  $p=0.02$ ) despite the fact that residents in this group started out with a significantly lower baseline score (57.8 vs. 67.6,  $p=0.04$ ). Scores in the management of colposcopy category improved significantly in this high attendance group (+11.3%,  $p=0.01$ ). Attendance did not impact scores on the categories of medical knowledge, diagnosis and biopsy placement. Year of training was associated with improved performance for fourth-year (overall score (+10.0%,  $p=0.002$ ) and diagnosis score (+14.7%,  $p=0.03$ ) and third-year residents (management scores (+12.0%,  $p=0.05$ )).

**Conclusions:** This study suggests that a multidisciplinary colposcopy curriculum is a feasible and effective addition to a residency education program. Participation in this program may improve residents' competency and confidence in colposcopy especially in conjunction with clinical experience.

### Introduction

Colposcopy has gained wide acceptance as the dominant modality in evaluating women with abnormal cervical cytology. It is a necessary adjunct in differentiating low-risk lesions from lesions more likely to progress to invasive cervical cancer [1]. Colposcopy is technically challenging and may pose management dilemmas to providers, especially in the face of complex algorithms and changing guidelines that are difficult to teach via conventional methods.

Training providers in the technical aspects of colposcopy is challenging due to poor reproducibility even amongst experienced colposcopists [2,3]. Recent changes in guidelines for management of abnormal cervical cytology

and cervical dysplasia represent an additional challenge for providers. Studies have shown significant non-adherence to the American Society of Colposcopy and Cervical Pathology (ASCCP) 2006 guidelines [4, 5]. All of these studies demonstrate the need for focused education in colposcopy in order to standardize management, improve reproducibility and empowers clinicians to integrate changing guidelines into practice.

Inaccurate colposcopy and incorrect management results in unnecessary tests, biopsies, and anxiety for patients [6]. Studies have shown that women experience high levels of anxiety before colposcopy, which can result in pain and discomfort during the procedure and lead to noncom-

pliance [7]. Overtreatment of cervical lesions is not innocuous. Cervical excision procedures have been proven to increase obstetric complications such as preterm labor, delivery of low birth weight infants, and cervical insufficiency [8-10]. In addition to the burden on the patient, unwarranted testing and treatment burdens society may contribute to excessive costs of healthcare. The American College of Obstetricians and Gynecologists (ACOG) has recognized that training in colposcopy should occur during a four-year obstetrics and gynecology residency and should be comprised of both didactic and clinical elements [11]. Most Obstetrics and Gynecology and Family Medicine residency programs include curricula for colposcopy education [12]. Educators agree these programs should focus on classification of abnormalities and identifying areas for biopsy, but a standard didactic curriculum or number of colposcopic examinations necessary for competence have not been determined [13,14]. We sought to create a multidisciplinary colposcopy curriculum for obstetrics and gynecology residents, and evaluate its impact on residents' knowledge and management of colposcopy.

## Methods

All residents in the New York University Department of Obstetrics and Gynecology residents participated in the colposcopy curriculum from August 2010 through May 2012. The curriculum was constructed based on input from faculty in obstetrics and gynecology, cytopathology and the ASCCP educational support team [15]. The curriculum consisted of a monthly interdisciplinary colposcopy conference for all residents and weekly didactic sessions during residents' ambulatory care rotations (See Table 1 for reading materials the residents accessed online.) This curriculum was in addition to pre-existing clinical exposure to colposcopy in ambulatory care rotations for 8 weeks a year in the third and fourth years of training. Using the ASCCP Resident Assessment of Competency (RAC) in Colposcopy Exam at baseline and after participation in the curriculum, this prospective study examines the impact of the colposcopy training program on competency in colposcopy. A convenience sample of residents in the program was used, and residents were not randomized, as this was a curricular intervention introduced into the residency curriculum. We conducted pair-wise comparisons of examination scores before and after the administration of the colposcopy curriculum with each resident's baseline performance serving as its own control.

### Interdisciplinary colposcopy conference

Third-year residents presented five clinical cases for discussion at a monthly one-hour conference attended by medical students, obstetrics and gynecology residents, fellows in pathology and gynecologic oncology, and attending cytopathologists, gynecologists, and gynecologic oncologists. Patients' clinical history and colposcopic images, histologic slides are reviewed. Management and questions related to the clinical case are discussed in a group format.

This one-hour conference takes place during the weekly protected didactic block time (3 hours per week), and approximately 8% of total didactic time was dedicated to this activity. Attendance at the conference was mandatory, but sometimes

precluded by clinical duties or other conflicts. Attendance was not recorded consistently during the time of the study, so this data was not included in the analysis.

### Small-group didactic sessions

Second, third and fourth-year residents participated in mandatory weekly small-group didactic sessions with gynecology attendings during ambulatory care rotations, for approximately seven sessions per year (14 during the 2-year study period). In these ninety-minute sessions, residents reviewed readings (30 minutes, see Table 1) and cases (60 minutes). Chart review involved discussing patient cases for upcoming colposcopy clinics, reviewing prior results and coming up with management plans for the upcoming visit. These sessions occurred before clinic outside of protected didactic time, so attendance varied and was tracked electronically by a supervising attending. After collaborating with residency program leadership and residents, we chose meeting time for those sessions to take place from 7:45 am to 9:00 am, prior to start of the clinic sessions. Even though we chose this meeting time what we should would least likely to interfere with clinical coverage and other conflicts, we could not assure that residents could attend all planned session, and as a result, attendance varied.

### Curriculum Evaluation: ASCCP Residents' Assessment of Competency (RAC) in Colposcopy Exam:

We evaluated the impact of the curriculum using the RAC Exam. Prior to implementation of the curriculum, all residents took the RAC exam, a one-hour, case-based on-line test that assesses medical knowledge, diagnosis and patient management competencies in colposcopy. This exam is written and maintained by ASCCP and available to any residency program. Score reports include median and mean score for the entire program, high and low scores and individual resident scores categorized by medical knowledge, diagnosis, biopsy placement and management, but not individual question results.

Scores on the ASCCP exam at baseline prior to the roll out of the curriculum (December 2010) and after one (2011) and two (2012) years of the curriculum implementation were used to look at resident performance taking into account year of training and attendance.

Scores were compared between residents who attended 0-5 sessions (low-attendance group) and those who attended >6 sessions (high-attendance group) (Table 2). The cut-off of 5 completed sessions was used to provide comparable numbers of residents in low- and high-attendance groups, and made sense based on the curriculum. Performance was categorized by elements of the RAC exam: overall score, medical knowledge, diagnosis, biopsy placement, and management.

### Qualitative assessment

Residents completed a survey after the first year of the curriculum to assess their impression of the quantity and relevance of reading material, the organization of the colposcopy conferences and didactic sessions, and the usefulness of the online resources available.

Week	Topic covered
1	Management algorithms
2	Accuracy of colposcopy
3	Specialty populations
4	Excisional procedures
5	Screening
6	HPV vaccine
7	Vulvar/vaginal intraepithelial neoplasia

**Table 1:** Colposcopy journal club curriculum

## Statistical analysis

The data were analyzed using a paired t-test of resident's scores before and after the training sessions and ANOVA test for analyses by year of residency. The statistical analyses were performed using the IBM SPSS statistical software, version 21 (IBM Corp., Armonk, NY). A p-value of <0.05 was considered to be statistically significant.

## Results

Thirty-seven residents in the program participated in the colposcopy curriculum from December 2010 to May 2012. Residents who graduated the program before 2-year follow-up exam were excluded from final analysis, as they did not complete the follow-up exam. Nineteen residents took both the

Score (%)	Attendance (number of sessions)	Number of residents	Baseline pre-test	2-year follow up post-test	Mean difference, 2010-2012	P-value P-value within attendance group
<b>Overall</b>	Low (0-5)	8	67.6	64.6	-3	0.45
	High (6-13)	11	57.8	66.5	8.7	0.02
<b>P-value between attendance groups</b>			0.04	0.67		
<b>Medical Knowledge</b>	Low (0-5)	8	72.9	74.9	2	0.77
	High (6-13)	11	59.9	72	12.1	0.13
<b>P-value between attendance groups</b>			0.16	0.7		
<b>Diagnosis</b>	Low (0-5)	8	57.5	63.5	6	0.22
	High (6-13)	11	56	62.2	6.2	0.2
<b>P-value between attendance groups</b>			0.8	0.72		
<b>Biopsy Placement</b>	Low (0-5)	8	84.5	66.6	-17.9	0.1
	High (6-13)	11	67.5	71.4	3.9	0.6
<b>P-value between attendance groups</b>			0.04	0.65		
<b>Management</b>	Low (0-5)	8	67	59.5	-7.5	0.25
	High (6-13)	11	54.2	65.5	11.3	0.01
<b>P-value between attendance groups</b>			0.04	0.35		

**Table 2:** Mean residents' scores on the ASCCP Residents' Assessment of Competency in Colposcopy Exam based on attendance at in small-group didactic sessions

1-year and 2-year follow-up exams, and represent the study group for statistical analysis.

As Table 2 demonstrates, among these 19 residents, 8 attended 5 or fewer small-group didactic sessions (low attendance), and 11 attended 6-13 sessions (high attendance). First year residents were excluded from analysis because they did not participate in small group sessions based on their clinical schedule, which did not include ambulatory rotations. The residents in the high attendance group improved in overall score at the 2-year follow up exam (+8.7%,  $p=0.02$ ) despite a lower baseline score (57.8 vs. 67.6,  $p=0.04$ ). Management of colposcopy also improved significantly in this high attendance group (+11.3%,  $p=0.01$ ). No difference was noted in medical knowledge, diagnosis and biopsy placement when categorized by number of sessions attended, only non-significant trend in improved medical knowledge in those residents who attended more sessions. Biopsy placement scores were significantly lower at baseline in the high attendance group (67.5 vs. 84.5,  $p=0.04$ ) but no significant change in biopsy placement scores was seen at a 2 year follow up test.

When resident performance was evaluated by the year of training (Table 3), fourth-year residents (class of 2012) had statistically significant improvements in overall score (+10.0%,  $p=0.002$ ) and diagnosis scores (+14.7%,  $p=0.03$ ), and positive trends were also noted in medical knowledge, biopsy placement, and management scores, although these were not statistically significant. Third-year residents (class of 2013) improved in management scores (+12.0%,  $p=0.05$ ) and positive trends were noted in overall and medical knowledge scores but were not statistically significant; biopsy placement showed a slight non-significant decrease (-2.5%,  $p=0.65$ ) in this group. For the class of 2014 (second year residents) there were no significant differences in any of the scores. In this class, non-significant decrease was noted in overall score, medical knowledge, biopsy placement and management, and a non-significant improvement was noted in diagnosis.

The scores were also analyzed between class year groups as shown in Table 3. Differences between class year groups were not significant.

Residents' responses on the qualitative assessment suggested that reviewing colposcopy articles and guidelines and discussing patient cases in didactics and conferences were useful in their understanding of the management of abnormal cytology and histology. All residents found the ASCCP website and additional online materials useful as a reference. Several first-year residents felt that incorporating a colposcopy lecture series for their class prior to the start of the curriculum to review the basics of colposcopy would be a helpful adjunct to the curriculum. Overall, residents felt the ASCCP test addressed all of the important elements of competence in colposcopy. However, residents were frustrated that the ASCCP test did not allow examinees to review incorrect answers or explanations, and as such was not useful for their formative assessment.

## Conclusions

A colposcopy curriculum composed of multi-disciplinary

case conferences and small-group didactic sessions is a feasible and well-received addition to a resident education program. Participation in this program may improve residents' competency in colposcopy. The longitudinal, case-based nature of the curriculum allows residents to understand the guidelines for colposcopy, and then to learn how to put them into use in their clinical work. Given the clinical importance of management decisions in colposcopy, these skills are important to emphasize during training, and a structured curriculum has the potential to help standardize management and improve adherence to changing guidelines.

We found that residents who attended more than 5 small-group didactic sessions improved their overall score and management score on the ASCCP exam despite lower baseline scores. Residents in the third and fourth year had more significant improvements, and these residents were also participating in clinical exposure to colposcopy. It was noted that those residents who started out with lower scores showed the most improvement. This curriculum may be a useful adjunct to clinical training in colposcopy, and may be especially useful for residents with lower baseline competency in colposcopy. First-year residents who did not attend clinic or small-group sessions based on rotation schedules performed worse on the exam which is consistent with deterioration of prior knowledge base over time without additional training, support or clinical exposure.

This study is limited by its design that did not include randomization, and selection bias may have contributed to more motivated residents attending more sessions. The small size of the study was based on the available residents in the program, however some significant findings were revealed even with limited sample size. Future studies might be possible with collaboration between institutions to increase the sample size and to investigate the trends observed in this relatively small sample.

Since biopsy placement is considered to be a very important part of colposcopy, the fact that it was not impacted was a concern and a potential deficit of this curriculum. Biopsy placement was taught during colposcopy conferences using still images and not via interactive experiences that might be more effective teaching modalities. Evaluation of cervical lesions during colposcopy is a dynamic process and might be better evaluated in clinical setting, and this curriculum was not a part of clinical colposcopy activities.

There were several patterns within the data that are difficult to explain, and likely reflect the small sample size of the group. First, baseline scores at the initiation of the study tended to be non-significantly higher in junior residents than senior residents. One possible explanation of this difference could be that our evaluation tool, the ASCCP RAC exam, was not a valid tool. However, the ASCCP RAC exam is created by the major national oversight body for management of abnormal cervical cytology and histology. It underwent extensive internal validation process; questions were written by a multidisciplinary ASCCP Assessment Committee of colposcopy

Score (%)	Year	Number of residents	Baseline pre-test	2-year follow up post-test	Mean difference	P-value within attendance group
Overall	Class 2012	6	57.0	67.0	+10.0	0.002
	Class 2013	7	60.7	66.7	+6.0	0.29
	Class 2014	6	68.3	63.2	-5.1	0.25
P-value between attendance groups			0.33	0.95		
Medical Knowledge	Class 2012	6	69.5	79.2	+9.7	0.25
	Class 2013	7	52.4	65.6	+13.2	0.26
	Class 2014	6	76.3	76.2	-0.1	0.98
P-value between attendance groups			0.20	0.94		
Diagnosis	Class 2012	6	47.3	62.0	+14.7	0.03
	Class 2013	7	61.7	61.7	+0.0	0.99
	Class 2014	6	60.0	64.7	+4.7	0.37
P-value between attendance groups			0.93	0.53		
Biopsy Placement	Class 2012	6	61.2	66.8	+5.6	0.68
	Class 2013	7	79.9	77.4	-2.5	0.65
	Class 2014	6	82.0	62.5	-19.5	0.18
P-value between attendance groups			0.22	0.93		
Management	Class 2012	6	58.7	66.0	+7.3	0.17
	Class 2013	7	54.9	66.9	+12.0	0.05
	Class 2014	6	66.0	55.3	-10.7	0.20
P-value between attendance groups			0.41	0.45		

**Table 3:** Mean residents' scores on ASCCP Residents' Assessment of Competency in Colposcopy Exam by year of residency training

experts, which wrote, modified and revised questions and cases. Based on the performance of test takers, the exam is periodically reviewed. Questions that too many people get right or get wrong are removed from the exam. We believe that RAC exam is the best available assessment of competence in colposcopy. We did not assess clinical competence in this study to see how residents make their decisions in a clinical setting or how their care impacted patient outcomes, and we had to rely on ASCCP test as an indirect measure of competency.

In the post-implementation period of this study, we

made several changes to the curriculum. Since monthly colposcopy conferences took up a significant number of protected didactic time, and fitting it into an already crowded list of residency requirements became challenging, we decreased that number to 6 one-hour sessions per year from 12 (8 to 4% total didactic time). The structure for small-group sessions was unchanged as it fit within the ambulatory care rotation and was well-received by residents.

The optimal timing and amount of exposure to colposcopy education has not been identified. Examining clinical



performance for residents based on participation in the curriculum would be an important addition to understand the impact of this education on patient care.

This longitudinal, case-based nature of the curriculum allows residents to understand the guidelines for colposcopy, and then to learn how to put them into use in their clinical work. Given the clinical importance of management decisions in colposcopy, these skills are important to emphasize during training, and a structured curriculum has the potential to help standardize management and improve adherence to changing guidelines.

We hope that this study would be considered by OB-GYN educators and residency program leadership and would lead to changes in residency program curriculum.

## Acknowledgements

We would like to thank Dr. Alan Waxman from the University of New Mexico for his help with the implementation of this program and Dr. Aylin Simsir from the NYU Department of Pathology. We would like to acknowledge Dr. Elizabeth Speed and Dr. Kiranpreet Chawla for their contributions as educators in the didactic portion of the course.

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