

# Accuracy of physician and nurse practitioner colposcopy to effect improved surveillance of cervical cancer

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## Summary

**Purpose:** To compare physician and nurse practitioner accuracy in recognizing cervical dysplasia during colposcopy. **Materials and Methods:** A retrospective review was performed of cervical excisional biopsies from 2007 to 2009 performed by gynecologists and nurse practitioners in the same patient population. Cervical cone biopsy and loop electrosurgical excision procedure (LEEP) pathology were used as a gold standard compared to the previous colposcopy biopsies. **Results:** Four hundred fifty-five patients qualified for the study. Patients were stratified according to age: under 30 years, 30-39, and 40 and above. For physicians, 77% of high-grade colposcopy biopsy results agreed with high-grade pathology on cone biopsy or LEEP. This was statistically similar to nurse practitioner results ( $p = 0.12$ ). Likewise, there was no significant difference between physician and nurse practitioner accuracy within the various patient age strata. **Conclusion:** Colposcopy biopsy results compared to cone biopsy or LEEP results were statistically similar between gynecologists and nurse practitioners.

**Key words:** Colposcopy; Colposcopic training; Cervical dysplasia; LEEP; Cold knife conization.

## Introduction

Cervical cancer mortality rates have steadily declined in the past 30 years by 50%, and this is attributed to early detection of cervical dysplasia due to prevention and as a result of screening [1, 2]. Their early detection has led to the treatment of preinvasive lesions [3]. Success in cervical cancer prevention has occurred due to the ability to detect and treat grade 3 cervical intraepithelial neoplasia (CIN3) prior to development of invasive disease [4]. Therefore, a special interest for clinicians is to recognize high-grade lesions at the time of colposcopy.

Screening for cervical dysplasia involves various modalities, including the Papanicolaou (Pap) smear and colposcopy. In the US, approximately 3.5 million of 5 million women undergoing Pap smear screening annually will require additional intervention for cytologic abnormalities [5]. In some European countries, colposcopy is performed routinely during the gynecologic visit, often in conjunction with the annual Pap smear [6]. However, in the United Kingdom and the United States, colposcopic exam usually follows an abnormal cytology result [6]. Colposcopic biopsies are directed at the most apical site of the cervix identified by the colposcopist [7].

It is imperative to have comprehensive, evidence-based teaching of physicians and nurse practitioners in colposcopy and management of cytologic abnormalities in order to continue to decrease the morbidity and mortality of cervical cancer. The increased numbers of colposcopists has improved access to care for women with abnormal clinical cytology and has likely decreased the waiting time for their evaluation [8]. The retrospective

review of colposcopic examinations by Baum *et al.* revealed favorable colposcopy results of gynecology residents; their study compared colposcopic impressions to cervical biopsy results. They concluded, however, that a more structured colposcopy training program would be preferred [5].

A standardized teaching of colposcopy does not currently exist in the United States for resident physicians and nurse practitioners, and there is discrepancy regarding the training requirements and experience required to obtain proficiency with colposcopy. Caruthers and Sheets recommend 30 supervised colposcopies [6]. Brotzman and Apgar advise 25-50 colposcopic examinations, including ten colposcopies for high-grade lesions [7].

The Council on Resident Education in Obstetrics and Gynecology (CREOG) suggests that residents should "perform and interpret the results of diagnostic procedures for cervical dysplasia" [9]. Additionally, the Accreditation Council for Graduate Medical Education does not define a required training program for colposcopy [5]. The American Society for Colposcopy and Cervical Pathology (ASCCP) currently recommends a 3-tiered system for colposcopy training. The first tier consists of a didactic program during residency training or through an accredited colposcopy course. The second tier of the system consists of mentored colposcopic instruction. The final tier of the program consists of completion of an exit examination [10]. The ASCCP offers a colposcopic mentorship program and reviews colposcopic cases with a written examination of colposcopic principles and practice [11].

Reduced cervical cancer rates are due to a number of factors, including technical expertise, high coverage rate, and rigorous quality assurance in the laboratory, in the colposcopy clinic, and in administrative offices [12].

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Development of accurate and reproducible methods of colposcopic assessment are needed to manage abnormal cervical screening results being referred for diagnosis and possible treatment [13].

Colposcopic examination has several restrictions to take into account. First, colposcopy is not a sufficient diagnostic method when the squamocolumnar junction is not entirely visible. A diagnostic cone biopsy is indicated then, although some colposcopists consider the large loop biopsy as a good diagnostic method in those patients. Second, colposcopy includes the subjective assessment of the impression by colposcopists, which consequently results in observer variability. Levels of agreement among experienced colposcopists increase as the cervical lesion becomes more severe. In the ASCUS-LSIL Triage Study (ALTS), the sensitivity of initial colposcopy for CIN3 identified during two years of observation was only 54% [14].

In our study, the gynecologists' accuracy in recognizing high-grade cervical dysplasia during the colposcopy exam was compared to that of nurse practitioners in the same department serving the same patient population. Having these two groups coming from two different backgrounds and colposcopy training methods gave us the opportunity to compare the two training techniques.

## Materials and Methods

All cold-knife cone and LEEP pathology results were retrospectively collected between 2007 and 2009. A total of 455 patients qualified for this study. After institutional IRB approval was obtained, all the cases were divided into two groups: colposcopy performed by physicians and those performed by nurse practitioners. Patients were also stratified by age: less than 30 years of age, 31-39 and 40 years and above.

Women who had colposcopy performed followed by successive cone biopsy or LEEP were included. Colposcopy was performed on patients with high-grade squamous intraepithelial lesions (HSIL) on pap smear cytology, persistent low-grade squamous intraepithelial lesions (LSIL), atypical squamous cells (ASC), or atypical glandular cells (AGC). Patients with cervical cancer were excluded due to the small number of cases to avoid statistical inconvenience, and patients with inconclusive biopsy results unable to be classified ( $n = 17$ ) were also excluded.

All colposcopic exams were performed and documented the same way: the key concepts of the system included the dimensions of color, vessel, border, and surface pattern. Descriptions of cervical findings in each category were classified as normal, preinvasive disease, and invasive disease. The procedure utilizes low power (3.5 $\times$ ) on colposcopy to obtain a general impression of the surface architecture of the cervix. Medium and high (7 $\times$ , 15 $\times$ ) powers are utilized to evaluate the vagina and cervix, and various light filters are available to highlight different aspects of the surface of the cervix. Three percent acetic acid solution is applied to the surface to improve visualization of abnormal areas. Areas of the cervix that turn white after the application of acetic acid or have an abnormal vascular pattern are biopsied. After a complete examination, the areas with the highest degree of visible abnormality are biopsied. Following any biopsies, an endocervical curettage (ECC) is done. The ECC utilizes a long straight curette or a cytobrush to obtain cells from the cervical

Table 1. — Comparison of medical doctor (MD) and nurse practitioner (NP) accuracy on biopsy.

Provider and age group	Kappa value	ASE	95% Confidence Limits		Test of Equality			
			Lower	Upper	n	chi-square	df	p value
<i>Total</i>								
MD	0.2406	0.0665	0.1104	0.3709	147	1.1351	1	0.2867
NP	0.1542	0.0465	0.063	0.2454	308			
<i>Under 30</i>								
MD	0.1907	0.1078	-0.0206	0.402	54	1.5326	1	0.2157
NP	0.0382	0.0596	-0.0787	0.1551	156			
<i>30 to 39</i>								
MD	0.1923	0.0983	-0.0004	0.385	63	0.4984	1	0.4802
NP	0.1022	0.0814	-0.0574	0.2617	65			
<i>40 and older</i>								
MD	0.3902	0.137	0.1218	0.6587	30	0.8653	1	0.3523
NP	0.2332	0.0987	0.0397	0.4267	57			

Table 2. — Comparison of medical doctor (MD) and nurse practitioner (NP) accuracy on the biopsy based on age.

Provider	Sensitivity	Exact p value	n
<i>Total</i>			
MD	77.14	0.1231	315
NP	82.38		
<i>Under 30</i>			
MD	71.05	0.0564	151
NP	84.96		
<i>30 to 39</i>			
MD	76.59	0.8268	122
NP	82.19		
<i>40 and older</i>			
MD	83.33	0.2348	42
NP	70.83		

canal. Monsel's solution is applied with large cotton swabs to the surface of the cervix to achieve hemostasis.

Interpretation of results was calculated with Cohen's  $\kappa$  Statistic [15] in order to determine the strength of agreement between colposcopy versus cone biopsy or LEEP pathology.

## Results

The gynecologist group performed a total of 147 of colposcopy exams which required cervical excisional biopsy, and the nurse practitioner group performed a total of 308 exams that ended up with excisional biopsy in the same time frame. For agreement between colposcopy biopsy and cone biopsy, gynecologists had a kappa of 0.24 and RNs had a kappa of 0.1542 (Table 1). These values were not significantly different. The highest agreement was for patients 40 and older. Among the patient group 40 years of age and older, the number of exams for gynecologists and nurse practitioners were 30 and 57, respectively. The provider-by-age stratified kappas still were not significantly different.

Excisional biopsy showed high-grade cervical dysplasia in 315 patients (Table 2). Considering excisional biopsy as the gold standard, the sensitivity of colposcopy examination for the MD group was 77.14% while the nurse practitioner group was 82.38% ( $p = 0.12$ ). None of the age bracket differences between nurse practitioners and MDs was statistically significant, but the difference for under age 30

Table 3. — Age distribution and timeframe between colposcopy and excisional biopsy.

Provider	Variable	N	Mean	Standard deviation	Minimum	Lower quartile	Median	Upper quartile	Maximum
MD	Age	147	32.74	7.53	20	27	31	38	58
NP	Age	308	31.72	9.65	17	25	29	36	68
	Days to excisional biopsy	308	66.16	54.26	5	34	53	78.5	565

MD = medical doctor; NP = nurse practitioners.

was “borderline” ( $p = 0.06$ ). For patients from ages 30 to 39, the MD group sensitivity was 76.59%, and nurse practitioner group sensitivity was 82.19% ( $p = 0.82$ ). The only age bracket for which the MD group sensitivity was higher than nurse practitioners was patients 40 and older. The MD group compared to nurse practitioners was 83.33% vs 70.83%, respectively ( $p = 0.23$ ).

Both sets of provider patients had similar age distributions. The mean age for the MD group was  $32.74 \pm 7.53$  versus  $31.72 \pm 9.65$  for the nurse practitioner group (Table 3). On average, the time lapse from the colposcopy exam to the excisional biopsy was  $66 \pm 54.26$  days. Being the only tertiary care hospital partially explains the lag time from colposcopy to excisional biopsy. Additionally, our teaching hospital provides indigent care, and the scheduling, transportation, and follow-up obstacles for these patients also prolong the lag time. We do, however, have a strong patient follow-up system, which helps us to eventually reach patients initially lost to follow-up.

## Discussion

In this study, we focused on the patients who received excisional biopsy after colposcopy exam following ASCCP guidelines. All consecutive excisional biopsies were used as a gold standard compared to the last colposcopy biopsy results. Furthermore, all the colposcopies were performed by trained nurse practitioners or gynecologists. Colposcopic impressions for nurse practitioners and gynecologists were not statistically different. Nurse practitioners are able to perform the colposcopic exam within their first year of training to the same ability as medical doctors.

It is imperative for colposcopists to perform accurate colposcopies in order to appropriately care for these patients. The training involves multiple steps, which include understanding the indication for colposcopy, patient counseling, formation of a colposcopic impression, and taking cervical biopsies. During training, the goal of the colposcopist is to master these steps. Our nurse practitioners went through intense colposcopy training: a 3- to 5-day didactic course to evaluate and manage patients with abnormal Pap smears, including classroom instruction and clinical skills practice with live models. The course consists of description of preinvasive disease of the cervix, information regarding normal and abnormal features of the transition zone of the cervical os, performing colposcopy, and patient education. Nurse

practitioners are required to perform a minimum of 50 supervised colposcopies before certification. In this study, only post-certification cases were included. Gynecologists certified by the American Board of Obstetrician and Gynecologists train for colposcopy during their residency programs and also complete one of ASCCP’s 2-day colposcopy courses. At the time of study, the experience of the gynecologists ranged from 3-25 years post residency.

Cervical excisional biopsy may not be the best gold standard in certain situations. For example, in some cases, the whole lesion might have been removed at the time of biopsy done during colposcopy. However, both groups in our study were subject to the same shortcomings of the gold standard.

The ASCUS LSIL Triage Study (ALTS) Group looked at the effects the type of medical training and number of biopsies performed have on sensitivity of colposcopically guided biopsies [16]. In their study, the sensitivity of the procedure did not vary significantly by type of colposcopist. However, the sensitivity was significantly greater when the colposcopists took two or more biopsies instead of one ( $p < 0.01$ ), a pattern observed across all types of colposcopists, including nurse practitioners, general gynecologists, gynecologic oncology fellows, and gynecologic oncologists. Their results in terms of similarities between nurse practitioners and gynecologists in their colposcopy impressions also agree with our results.

The role of the nurse colposcopist has been established in some countries for a number of years. McPherson *et al.* published their experience in a New Zealand nurse colposcopist training program. They reported on a clinical audit undertaken to assess the diagnostic skills of the nurse colposcopist measuring colposcopy: histology: cytology correlation. An 82% (82/100) colposcopy: histology: cytology correlation was achieved by the nurse in the third phase of her training program. The results were almost identical with our study; our nurse practitioner group was 82.38%.

Effective screening to detect and treat cervical dysplasia is essential. Residency programs must strive to properly educate residents on the performance of colposcopy to decrease the morbidity and mortality of cervical cancer. The nurse practitioners can be an effective resource for cervical cancer screening using colposcopy as a preliminary screening method. Initial didactic training and continued training are needed to maintain colposcopic skills in both medical doctors and nurse practitioners.

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