

# The Adequacy of Papanicolaou Smears as Performed by Family Physicians and Obstetrician-Gynecologists

Kevin Fiscella, MD, MPH, and Peter Franks, MD  
Rochester, New York

**BACKGROUND.** Little is known about the quality of Papanicolaou (Pap) smears performed by family physicians and obstetrician-gynecologists.

**METHODS.** Using hospital archival records of Pap smears performed from 1995 to 1997, we compared the quality of Pap smear sampling and the rate of detection of significant cytologic abnormalities by family physicians and obstetrician-gynecologists. Using hierarchic logistic regression, we examined the relationship between physician specialty and Pap smear reports, controlling for patient age and socioeconomic position, multiple Pap smears performed by the same clinician, and physician attending status.

**RESULTS.** A total of 34,916 Pap smears performed by 130 family physicians and 88 obstetrician-gynecologist residents and attending physicians were included in the analysis. There were no statistically significant differences by specialty in the rates of unsatisfactory reports (adjusted odds ratio [AOR] = 0.82; 95% confidence interval [CI], 0.48 - 1.38), satisfactory but limited reports (AOR = 1.16; 95% CI, 0.93 - 1.48), or detection rates of significant cytologic abnormalities (AOR = 0.83; 95% CI, 0.66 - 1.04). However, family physicians submitted more Pap smears with an absent endocervical component (AOR = 1.50; 95% CI, 1.07 - 2.11).

**CONCLUSIONS.** These findings show no significant differences by specialty in Pap smear quality as measured by rates of unsatisfactory and satisfactory but limited reports, or detection of cytologic abnormalities. The finding of higher rates of absent endocervical cells, if replicated by further study, may suggest the need for improved training of family physicians in sampling the endocervix.

**KEY WORDS.** Papanicolaou smear; cytology; physician, family; gynecology. (*J Fam Pract* 1999; 48:294-298)

Submitted, revised, December 30, 1998.

From the Primary Care Institute, Highland Hospital, and the Departments of Family Medicine and Community and Preventive Medicine, University of Rochester School of Medicine and Dentistry. Reprint requests should be addressed to Kevin Fiscella, MD, Family Medicine Center, 885 South Ave, Rochester, NY 14620.  
E-mail: Kevin\_Fiscella@urmc.rochester.edu.

Do gynecologists perform better Papanicolaou (Pap) smears than family physicians? David Wilbur, MD, an academic pathologist,<sup>1</sup> advised readers of *Prevention* magazine to "go to someone skilled in taking Paps . . . and that usually means a gynecologist or nurse clinician working with a gynecologist." There are few data, however, that compare the quality of Pap smears performed by different clinicians.

Reissman<sup>2</sup> reported that rates of adequacy of Pap smear specimens did not differ between the departments of family medicine and obstetrics-gynecology. However, that study was not specifically designed to evaluate this question, and the analysis did not control for confounding or multiple Pap smears performed by the same physician. Kane and colleagues<sup>3</sup> compared the Pap smear adequacy rates of family practice residents with family practice faculty and found positive correlation with physician experience. But they did not control for confounding or multiple Pap smears by the same physician, either.

Although the clinical usefulness of Pap smear adequacy has been debated,<sup>4,5</sup> most pathologists currently categorize it according to the Bethesda System.<sup>6</sup> In this system, Pap smear specimens are classified into 1 of 3 categories: satisfactory for evaluation, satisfactory for evaluation but limited, and unsatisfactory. As this classification system suggests, there are a number of sampling factors that may affect the adequacy of Pap smear testing. These include adequacy of sampling from the transformation zone as indicated by the presence of columnar or metaplastic cells, thickness of smear, and number of cells.<sup>7,9</sup>

We used hospital archival Pap smear records to compare the quality of Pap smear sampling and the rate of detection of significant cytologic abnormalities by family physicians with that of obstetrician-gynecologists.

## METHODS

### SAMPLE

From August 1995 to December 1997, 44,274 Pap smears were submitted to the local community hospital cytology laboratory. Family physicians and obstetrician-gynecologists who admitted patients primarily to this hospital usually sent their Pap smears to the hospital pathology department. Pap smears were excluded from the analysis if they were performed by clinicians other than family physicians or obstetrician-gynecologists ( $n = 6940$ ). An additional 2418 Pap smears were excluded because submitted information indicated they were repeated on the same women during the same

year or they were associated with a biopsy. There were a total of 34,916 Pap smears performed on 32,795 women during the study period. Of these, 3664 were performed by 57 attending family physicians, 2033 by 73 family physician residents, 27,894 by 52 obstetrician-gynecologist attending physicians, and 1325 by 36 obstetrician-gynecologist residents. Approximately 10% of these women had 2 or more Pap smears performed during the 3 years.

## DATA COLLECTION

The cytology department at the hospital uses the Bethesda System and maintains a permanent record of all Pap smears performed. Relevant data from the hospital files were downloaded to a computer for analysis.

## INDEPENDENT VARIABLES

The primary independent variable was the specialty of the physician performing the Pap smear (family physician or obstetrician-gynecologist). Specialty identification was made according to the hospital medical staff membership handbook, or the directories of the American Academy of Family Physicians or the American College of Obstetricians and Gynecologists for physicians who were not members of the medical staff.

## DEPENDENT VARIABLES

The dichotomous primary outcome variables were Pap smear reports of unsatisfactory or satisfactory but limited and the presence of cytologic abnormalities (eg, atypical cells of unknown significance [ASCUS], squamous intraepithelial lesions [SIL], carcinoma in situ, and invasive carcinoma). Secondary outcome variables included reasons noted by the cytotechnologist for a limited evaluation, such as absence of endocervical (columnar or metaplastic) cells, poor smear quality (eg, drying artifact, inadequate cellularity, field obscured by blood), and inadequate documentation on requisition. Several<sup>10-13</sup> but not all<sup>15</sup> studies suggest that the presence of endocervical cells is associated with improved detection of significant cytologic abnormalities, including invasive cancer.

## COVARIATES

The analysis controlled for potential confounding by age and socioeconomic position, multiple Pap smears performed by the same clinician, and physician attending status. Patients' ages may have affected sampling adequacy and may have been associated with rate of cytologic abnormalities. Patients' socioeconomic status may have been indirectly related to sampling adequacy because of infection-mediated cervicitis (which may obscure the field through white or red blood cells) and was likely to be directly related to rates of cytologic abnormalities. Physicians who performed different numbers of Pap smears (nesting), may have skewed specialty comparisons, so a multilevel model was used.

Patient's age was determined from the date of birth

on the report and was coded as a continuous variable. Socioeconomic status was determined by geocoding the patient's address to the census block. Multiple socioeconomic indicators for each census block were obtained from 1990 census data. To develop a socioeconomic measure, factor analysis was performed on the percent of people in the census block who are unemployed; who own cars; who own phones; who are female heads-of-household; who are African American, and Hispanic; who have obtained a ninth-grade education, some high school education, high school graduation, some college, or college graduation; median income; median home value; the proportion in blue-collar, handler, professional, executive, sales, service, support, technical, transportation, and white-collar occupations. Using the eigenvalue criterion of  $>1$ , one factor emerged with all variables contributing  $>0.5$  to that factor. This was labeled the socioeconomic factor. Use of this methodology has been shown to be a valid measure of socioeconomic position.<sup>14-17</sup>

## STATISTICAL ANALYSIS

To adjust for the nesting of multiple Pap smears, the statistical program SUDAAN (Research Triangle Institute; Triangle Park, North Carolina)<sup>18</sup> was used to implement the Generalized Estimating Equation in the reported logistic regression analyses. The exchangeable working correlation was used, on the assumption that the correlations of each observation (a patient Pap smear) for each physician would be similar. Because of differences in mean age by physician category, initial analyses included age squared as a covariate to detect nonlinear effects of age in the outcomes of interest. This variable was not found to be significant or to produce any change in the parameter estimates of the main independent variables of interest and was excluded. Because of missing or bad addresses, the socioeconomic status for some patients ( $n = 6419$ ) could not be derived. This variable was also excluded when it was not significantly related to the outcome or did not significantly change the parameter estimate for the main independent variable.

## RESULTS

The means and proportions for each key variable by specialty and attending status are shown in Table 1. Patients of residents were younger than those of all attending physicians, and patients of attending obstetrician-gynecologists had significantly higher socioeconomic status than those of the other clinicians. Attending obstetrician-gynecologists performed significantly more Pap smears than other clinicians and, in both specialties, attending physicians performed more Pap smears than residents. Unadjusted rates of unsatisfactory reports ranged from 0.6% to 1.2%, and rates of no endocervical cells ranged from 7.5% to 14.5%. These rates are comparable with published rates that used optimal collection devices.<sup>19-22</sup>

TABLE 1

## Relationship of Specialty and Attending Physician Status to Other Key Variables

Variable	Attending Family Physician (n = 57)	Resident Family Physician (n = 73)	Attending OB-GYN (n = 52)	Resident OB-GYN (n = 36)
No. Pap smears	3664	2033	27,894	1325
Pap smears per physician, mean (SD)	21.8 (41.8)	13.7 (18.5)	427.1 (951.4)	7.7 (12.2)
Patient age in years, mean (SD)	40.3 (15.3)	36.4 (13.3)	42.3 (14.0)	34.1 (13.7)
Socioeconomic score,* mean (SD)	-0.05 (1.00)	-0.36 (1.15)	0.37 (0.72)	-0.06 (1.07)
No. endocervical cells, %	14.6	13.3	10.9	7.5
Poor documentation, %	18.5	19.5	15.1	18.9
Satisfactory but limited Pap smear, %	11.6	12.7	10.5	10.4
Unsatisfactory Pap smear, %	0.8	0.7	0.6	1.2
Abnormal Pap smear, %	5.6	9.0	5.0	14.7

OB-GYN denotes obstetrician-gynecologist; SD, standard deviation.

\*For the socioeconomic score, a higher score means a higher (eg, more education, more income) socioeconomic position.

After adjustment, there were no statistically significant differences between family physicians and obstetrician-gynecologists in rates of unsatisfactory reports (adjusted odds ratio [AOR] = 0.82; 95% confidence interval [CI], 0.48 - 1.38); satisfactory but limited reports (AOR = 1.16; 95% CI, 0.93 - 1.48), or detection of significant cytologic abnormalities (AOR = 0.83; 95% CI, 0.66 - 1.04) (Table 2). However, further analysis of the satisfactory but limited category showed that family physicians had higher rates of Pap smears with no endocervical cells noted (AOR = 1.50; 95% CI, 1.07 - 2.11). Similar effects were observed for both attending physicians and residents. These specialty differences were not significantly attenuated by adjusting for the number of Pap smears performed, other evidence of unsatisfactory Pap

smears, or poor documentation. There were no statistically significant differences in rates of poor quality smears or inadequate documentation.

Because the significance of absent endocervical cells has been disputed,<sup>9</sup> we examined the association of absent endocervical cells with detection of cytologic abnormalities in this data set. The absence of endocervical cells was significantly associated with lower rates of detection of any cytologic abnormalities (AOR = 0.35, 95% CI, 0.18 - 0.66) or SIL or higher grade lesions (AOR = 0.31, 95% CI, 0.19 - 0.49).

## DISCUSSION

This study of hospital archival Pap smear records showed no statistically significant differences between the Pap smear reports performed by family physicians and obstetrician-gynecologists and classified as either unsatisfactory or satisfactory but limited. There were also no statistically significant differences by specialty in rates of cytologic abnormalities. According to these measures, the quality of Pap smears performed

by family physicians was comparable with those by obstetrician-gynecologists.

However, further analysis of reasons for limited evaluation revealed unsettling findings. Pap smears performed by family physicians had 50% higher adjusted rates of absent endocervical cells. Although the significance of recovery of endocervical cells has been debated,<sup>9</sup> in our study the presence of endocervical cells was associated with detection of significant cytologic abnormalities, including ASCUS, SIL, and higher grade lesions. The absence of reliably recorded information regarding the sampling devices used precluded a determination of whether specialty differences in sampling devices accounted for differences in recovery of endocervical cells. Previous studies have suggested, however, that use

TABLE 2

**Comparison of Adjusted Rates of Pap Smear Quality and Detection of Significant Cytologic Abnormalities Between Those Performed by Family Physicians and Obstetrician-Gynecologists**

Measure	Odds Ratio	95% CI	P
Unsatisfactory	0.82	0.48 - 1.38	.45
Satisfactory but limited	1.16	0.93 - 1.48	.18
No endocervical cells	1.50	1.07 - 2.11	.02
Poor smear quality	1.00	0.81 - 1.23	1.00
Poor documentation	0.96	0.77 - 1.20	.73
Cytologic abnormalities	0.83	0.66 - 1.04	.11

CI denotes confidence interval.

of the Cytobrush or Cervex brush,<sup>2,23</sup> combined endocervical and ectocervical sampling,<sup>24</sup> removal of mucus,<sup>8</sup> and satisfactory smear quality<sup>25</sup> improves sampling adequacy and detection of cytologic abnormalities.

These results should prompt family physicians to examine their own rates of sampling, particularly their recovery of endocervical cells. If the rates are found wanting, they should consider adopting the techniques that have been associated with higher recovery of endocervical cells.

These results also underscore the need for systematic monitoring and feedback to clinicians regarding the adequacy of their Pap smear sampling. Educational interventions designed to improve the Pap smear performance of clinicians whose performance is subpar may be effective,<sup>2,22,26</sup> though further study through randomized controlled trials is needed. In the future, hospitals and managed care organizations may begin using Pap smear performance data to credential clinicians who want to perform Pap smears.

### LIMITATIONS

Our findings are tempered by the study limitations. They are not necessarily generalizable to other communities, and they may reflect local practice only. However, a second study conducted in North Carolina also found lower recovery rates of endocervical cells by family physicians compared with obstetrician-gynecologists (written communication, Peter Curtis, MD). There may be a need for improved education of family physicians in sampling the transformation zone of the cervix.

Although we found no statistically significant differences by specialty in terms of the primary performance measures, we cannot exclude the possibility of small clinically relevant differences. Because of the relative rarity of unsatisfactory reports and significant cytologic abnormalities, a much larger sample size is required to

detect smaller effects. On the basis of the 95% confidence intervals surrounding the specialty effects, we cannot exclude the possibility that family physicians have a 38% higher rate of unsatisfactory reports or a 51% lower rate of detection of significant cytologic abnormalities. Differences in rates of cytologic abnormalities, if found, might represent a referral bias; patients with cytologic abnormalities are more likely to be followed up by gynecologists than by family physicians.

Because of incomplete requisition information, we were not able to adequately control for pregnancy, menopause, or hysterectomy. Each of these factors may affect recovery of endocervical cells. We cannot exclude the possibility that family physicians had higher rates of no endocervical cells present because they performed more Pap smears on women who were pregnant or had hysterectomies. The

analysis did control for factors that are strongly associated with these variables, however, such as age and socioeconomic status, and routine Pap smear screening is not recommended for women who have had a hysterectomy.

### CONCLUSIONS

The quality of Pap smears performed by family physicians was comparable with obstetrician-gynecologists when measured by reports that were unsatisfactory, or satisfactory but limited, or of cytologic abnormalities. Further study is necessary, however, to corroborate findings of higher rates of absent endocervical cells on Pap smears performed by family physicians.

### ACKNOWLEDGMENT

This study was supported by a grant through the American Academy of Family Physicians Foundation.

### REFERENCES

1. Perlmuter C. The smart Pap. *Prevention* 1996; October:83.
2. Reissman SE. Comparison of two Papanicolaou smear techniques in a family practice setting. *J Fam Pract* 1988; 26:525-9.
3. Kane BR, Berger MS, Lisney M. Pap smear adequacy: the role of clinician experience. *Fam Med* 1997; 29:315-7.
4. Kivlahan C, Ingram E. Papanicolaou smears without endocervical cells: are they inadequate? *Acta Cytol* 1986; 30:258-60.
5. Mitchell H, Medley G. Longitudinal study of women with negative cervical smears according to endocervical status. *Lancet* 1991; 337:265-7.
6. Kurman RJ, Solomon D. The Bethesda System for reporting cervical/vaginal cytologic diagnosis. New York, NY: Springer-Verlag, 1994.
7. Vooijs GP, van der Graaf Y, Elias AG. Cellular composition of cervical smears in relation to the day of the menstrual cycle and the method of contraception. *Acta Cytol* 1987; 31:417-26.
8. Hamblin JE, Brock CD, Litchfield L, Dias J. Papanicolaou

- smear adequacy: effect of different techniques in specific fertility states. *J Fam Pract* 1985; 20:257-60.
9. Allingham JD, King A. Patient characteristics and endocervical cell recovery on Papanicolaou smears. *J Fam Pract* 1995; 20:185-90.
  10. Elias A, Linthorst G, Bekker B, Vooijs PG. The significance of endocervical cells in the diagnosis of cervical epithelial changes. *Acta Cytol* 1983; 27:225-9.
  11. Kristensen GB, Skyggebjerg KD, Holund B, Holm K, Hansen MK. Analysis of cervical smears obtained within three years of the diagnosis of invasive cervical cancer. *Acta Cytol* 1991; 35:47-50.
  12. Mitchell H, Medley G, Giles G. Cervical cancers diagnosed after negative results on cervical cytology: perspective in the 1980s. *BMJ* 1990; 300:1622-6.
  13. Vooijs PG, Elias A, van der Graaf Y, Veling S. Relationship between the diagnosis of epithelial abnormalities and the composition of cervical smears. *Acta Cytol* 1985; 29:323-8.
  14. Krieger N. Women and social class: a methodological study comparing individual, household, and census measures as predictors of black/white differences in reproductive history. *J Epidemiol Comm Health* 1991; 45:35-42.
  15. Krieger N. Overcoming the absence of socioeconomic data in medical records: validation and application of a census-based methodology. *Am J Public Health* 1992; 82:703-10.
  16. Cherkin DC, Grothaus L, Wagner EH. Is magnitude of copayment effect related to income? Using census data for health services research. *Soc Sci Med* 1992; 34:33-41.
  17. Selby JV, Fireman BH, Swain BE. Effect of a copayment on use of the emergency department in a health maintenance organization. *N Engl J Med* 1996; 334:635-41.
  18. Research Triangle Institute. SUDAAN: professional software for SURVEY DATA ANALYSIS. Research Triangle Park, NC; 1991.
  19. Pachciarz JA, Abbott MI, Gorman B, Henneman CE, Kuhl M. Continuous quality improvement of Pap smears in an ambulatory care facility. *Q Quality Rev Bull* 1992; 18:229-35.
  20. Fokke HE, Salvatore CM, Schipper ME, Bleker OP. The quality of the Pap smear. *Eur J Gynaecol Oncol* 1992; 13:445-8.
  21. Ruffin MT, Van Noord GR. Improving the yield of endocervical elements in a Pap smear with the use of the cytology brush. *Fam Med* 1991; 23:365-9.
  22. Curtis P, Varenholt JJ, Skinner B, Addison L, Resnick J, Kebede M. Development of a Pap smear quality-assurance system in family practice. *Fam Med* 1993; 25:135-9.
  23. Buntinx F, Brouwers M. Relation between sampling device and detection of abnormality in cervical smears: a meta-analysis of randomised and quasi-randomised studies. *BMJ* 1996; 313:1285-90.
  24. Eisenberger D, Hernandez E, Tener T, Atkinson BF. Order of endocervical and ectocervical cytologic sampling and the quality of the Papanicolaou smear. *Obstet Gynecol* 1997; 90:755-8.
  25. Henry JA, Wadehra V. Influence of smear quality on the rate of detecting significant cervical cytologic abnormalities. *Acta Cytol* 1996; 40:529-35.
  26. Norton PG, Shaw PA, Murray MA. Quality improvement in family practice: program for Pap smears. *Can Fam Phys* 1997; 43:503-8.