GENERAL GYNECOLOGY

Human papillomavirus and Papanicolaou tests screening interval recommendations in the United States

Katherine B. Roland, MPH; Ashwini Soman, MBBS, MPH; Vicki B. Benard, PhD; Mona Saraiya, MD, MPH

OBJECTIVE: Guidelines recommend when the human papillomavirus (HPV) and Papanicolaou tests are used together (HPV co-test) for routine cervical cancer screening, screening intervals can be extended to 3 years. We assessed HPV test practices and Papanicolaou test screening interval recommendations of US providers.

STUDY DESIGN: Using a multistage probability design, we analyzed nationally representative data that were collected in 2006 through the Centers for Disease Control and Prevention's National Ambulatory Medical Care Survey and National Hospital Ambulatory Medical Care Survey.

RESULTS: Approximately 51% of providers ordered the HPV co-test; however, clinical vignettes found that <15% of providers who ordered the HPV test recommend the next Papanicolaou test in 3 years for women with concurrent normal HPV co-test results and a documented normal screening history.

CONCLUSION: Overall, annual cervical cancer screening continues to be a common recommendation, regardless of whether a screening history has been established or an HPV test has been ordered.

Key words: cervical cancer screening, HPV test, screening guideline, screening interval

Cite this article as: Roland KB, Soman A, Bernard VB, et al. Human papillomavirus and Papanicolaou test screening interval recommendations in the United States. Am J Obstet Gynecol 2011;205:xx-xx.

The Papanicolaou test is recognized as an effective and successful cervical cancer screening test.[1] It has become an essential component of annual primary care for women with access to regular medical care. In addition, infection with high-risk human papillomavirus (HPV) has been identified as a principal cause of most cervical abnormalities and cervical cancers.[2-4] HPV tests to identify high-risk types of HPV are available for both cervical cancer screening and management. Administering the HPV test at the same time as the Papanicolaou test, (ie, HPV co-testing) is an efficient approach with practical advantages. The co-test screening approach is recommended only for use among women ≥30 years old by many US health and professional medical organizations.[5-7] Because of the negligible risk of invasive cervical cancer among women who have concurrent normal results on the Papanicolaou test and negative findings on the HPV test within 3-5 years,[6,8] the traditional annual screening interval for cervical cancer can safely be extended to every 3 years.

Even before the approval of the HPV co-test strategy by the US Food and Drug Administration in 2003, the American Cancer Society and the American College of Obstetricians and Gynecologists recommended extending the screening interval for cervical cancer to 2-3 years for women ≥30 years old who had a history of normal Papanicolaou test results. Studies of primary care provider practices, which have been conducted from 2003 to the present, clearly show that providers are not incorporating these recommended screening intervals with the Papanicolaou test alone in clinical practice.[9-13] To date, there are limited data[14] on how the HPV co-test strategy is being adopted, whether providers are using it according to guidelines and extending screening intervals, and how it has affected patient care and resource use. With this study, we hoped to assess the state of HPV testing and co-testing practices and to document the recommendations for screening intervals as given by private office-based providers and hospital outpatient departments (OPDs).

Materials and Methods

Data sources

The Centers for Disease Control and Prevention (CDC), Division of Cancer Prevention and Control, commissioned collection of the Cervical Cancer Screening Supplement (CCSS) beginning in 2006. The objective of the CCSS is to obtain national data on providers' self-reported cervical cancer screening practices. The CCSS is administered as a supplement to CDC's National Ambulatory Medical Care Survey[15] (NAMCS) and National Hospital Ambulatory Medical Care Survey[16] (NHAMCS).

NAMCS collects information on visits made to private office-based physicians

From the Epidemiology and Applied Research Branch, Division of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA (Ms Roland and Drs Benard and Saraiya), and Northrop Grumman (Dr Soman), Atlanta, GA.

Received March 14, 2011; revised April 25, 2011; accepted June 3, 2011.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

None of the authors reports a conflict of interest.

Reprints: Katherine B. Roland, MPH, 4770 Buford Hwy, NE, MS K-55, Atlanta, GA. 30341. kroland@cdc.gov.

0002-9378/$36.00
Published by Mosby, Inc.
doi: 10.1016/j.ajog.2011.06.001

from a representative, randomly selected sample of physician offices in a 3-stage probability design that involves probability samples of primary sampling units, physician practices within primary sampling units, and patient visits within practices. Traditionally, only visits to the offices of non–federally employed physicians who were classified by the American Medical Association or the American Osteopathic Association as "office-based, patient care" had been included in the NAMCS. In 2006, however, NAMCS began collecting data from physicians and midlevel providers (physician assistants, nurse practitioners, and certified nurse midwives) who were employed in community health centers (CHCs), thus increasing the sample.

The NHAMCS, which uses a 4-stage probability design with samples of primary sampling units, hospitals within primary sampling units, clinics/emergency service areas within outpatient/emergency departments, and patient visits within clinics/emergency service areas. Information is collected on visits made to emergency and OPDs of noninstitutional general and short-stay hospitals, excluding federal, military, and Veterans Administration hospitals, that are located in the 50 states and the District of Columbia. The Census Bureau is the data collection agent for both the NAMCS and NHAMCS.

With the first administration in 2006, private office-based physicians, CHC providers, and OPD physicians from the NAMCS and NHAMCS sample were eligible to complete the CCSS if they provided Papanicolaou tests and specialized in general/family practice, internal medicine, obstetrics/gynecology, or general medicine. The CCSS was not sent to hospital emergency departments. The CCSS was shared with providers (either in the offices, CHCs, or hospitals) at the end of the established annual NAMCS/NHAMCS reporting period, when the interviewer was visiting. The CCSS was accompanied by an introductory letter that explained the importance of the information being collected and how responses would be protected. Completed surveys were mailed back or picked-up by the interviewer. Providers also had an option to complete the CCSS on a secure web portal that they could access with a supplied user name and password.

The 2006 CCSS was a 9-item self-administered questionnaire that took approximately 15 minutes to complete.[17] The NAMCS and NHAMCS protocols were approved by the Research Ethics Review Board of CDC's National Center for Health Statistics. The Research Ethics Review Board waived requirements to obtain informed consent from patients and patient authorization for health care providers to release medical record data.

Response rates were calculated according to Office of Management and Budget[18] Guidelines, which dictate that response rates for cross-sectional sample surveys are calculated as the product for 2 or more unit-level response rates. In 2006, of 495 eligible NAMCS and CHCs providers, 387 providers responded to the CCSS (61.1% unweighted response rate); however, we excluded 11 NAMCS records from our analysis that were identified as specializing in pediatrics or "other", which made the total NAMCS records to be analyzed 376. A total of 255 NHAMCS providers were considered eligible to participate in the CCSS, of which 216 providers responded (84.7% unweighted response rate).

Data measures

For office-based and CHC providers, demographics were collected through the American Medical Association and American Osteopathic Association master files. Variables that were collected included specialty, age, sex, race, and type of medical school graduate (United States vs foreign). Practice characteristics for office-based and CHC providers were collected through the physician induction interview. Variables that were collected included the number of providers in the practice, geographic region of the practice, and county population of the practice. Data that were collected on hospital OPD physicians included clinic specialty (limited to general medicine and obstetrics/gynecology), whether the OPD was affiliated with a teaching hospital, geographic region of the practice, and county population of the practice.

For this study, we examined the type of Papanicolaou test that had been used to screen for cervical cancer (conventional Papanicolaou test, liquid-based cytologic test, or both), if the practice orders the HPV test (which could include the reflex/recall or co-test approach), orders the HPV co-test, and recommendation for time until next Papanicolaou test screening.

Our primary outcome measures were (1) HPV co-test use and (2) recommended screening intervals for next Papanicolaou test among providers who order the HPV test, as assessed by clinical vignettes. HPV co-test use and practices were examined by asking whether the provider or clinic routinely ordered the HPV test at the same time as the Papanicolaou test. Providers who answered "Yes" were then asked for the age group of the patient for which they ordered the co-test.

Recommended screening intervals for the next Papanicolaou test were examined by asking whether the provider or clinic routinely ordered or provided the HPV test. Providers who answered "Yes" to ordering the HPV test were then asked their recommendation for next Papanicolaou test according to 3 clinical vignettes. The vignettes describe a woman between the ages of 30 and 60 years with a current normal Papanicolaou test with (1) no current HPV test results and a history of 2 consecutive normal Papanicolaou test results, (2) a current negative HPV test result and a history of 2 consecutive normal Papanicolaou test results, and (3) a current negative HPV test result and no history of Papanicolaou test provided. Note guidelines at the time of survey administration (2006) supported extending the screening interval up to 3 years in each of the vignettes described.[19-22]

Analysis

To provide a nationally representative sample of the providers and their practices, a sample weight that also accounted for nonresponse was assigned to each of the responders. We used SAS software (version 9. 2; SAS Institute Inc, Cary, NC) and SUDAAN software (release 10; Research Triangle Institute, Research Triangle Park, NC) to apply sam-

TABLE 1
Demographic characteristics of providers by setting: Cervical Cancer Screening Supplement, 2006

	Office-based providers (n = 376)		Hospital outpatient departments (n = 216)	
Characteristic	**n**	**% (95% CI)**	**n**	**% (95% CI)**
Specialty				
Obstetrics/gynecology	90	26.8 (22.7–31.2)	108	24.0 (17.4–32.1)
General/family practice[a]	170	46.0 (40.6–51.5)	—	—
General medicine	—	—	108	76.0 (67.9–82.6)
Internal medicine	57	23.9 (18.5–30.3)	—	—
Midlevel provider[b]	59	3.3 (2.4–4.7)	—	—
Age, y[c]				
<35	48	8.0 (4.9–12.9)	—	—
35 to <45	123	33.4 (26.7–40.9)	—	—
45 to <55	106	31.0 (25.0–37.6)	—	—
55 to <65	70	22.8 (17.6–29.0)	—	—
≥65	11	3.1 (1.4–6.6)[d]	—	—
Sex[c]				
Male	201	58.6 (51.7–65.2)	—	—
Female	173	41.3 (34.7–48.3)	—	—
Race				
White non-Hispanic	208	49.3 (42.1–56.5)	—	—
Black non-Hispanic	27	4.0 (2.5–6.4)	—	—
Asian	30	10.1 (6.2–16.1)	—	—
Hispanic	5	2.1 (0.8–5.7)[d]	—	—
Native American/Alaskan	4	0.01 (0.0–0.04)[d]	—	—
Other	9	4.6 (2.0–10.4)[d]	—	—
Unknown/missing	93	29.8 (23.9–36.5)	—	—
Medical school graduation[e]				
Foreign school	59	23.6 (17.5–30.9)	—	—
US school	219	65.4 (57.5–72.5)	—	—
Unknown/missing	39	11.1 (7.7–15.6)	—	—
Practice size[c,f]				
Solo practice	85	31.2 (24.1–39.2)	—	—
2 physicians	62	12.9 (9.2–18.0)	—	—
3-5 physicians	133	32.2 (25.6–39.7)	—	—
6-10 physicians	53	14.6 (10.1–20.7)	—	—
10 physicians	42	9.0 (5.2–15.2)	—	—
Affiliated with a teaching hospital[c]				
Yes	—	—	145	46.9 (34.3–59.9)
No	—	—	68	52.2 (39.2–65.0)

Roland. HPV co-testing and screening intervals. Am J Obstet Gynecol 2011.

(continued)

TABLE 1
Demographic characteristics of providers by setting: Cervical Cancer Screening Supplement, 2006 *(continued)*

Characteristic	Office-based providers (n = 376)		Hospital outpatient departments (n = 216)	
	n	% (95% CI)	n	% (95% CI)
Geographic region of practice[g]				
Northeast	72	16.9 (12.7–22.1)	74	27.0 (17.0–40.1)
Midwest	97	24.2 (18.8–30.5)	61	28.6 (17.5–43.0)
South	113	37.1 (31.2–43.3)	47	33.0 (20.5–48.4)
West	94	21.9 (16.4–28.6)	34	11.5 (5.4–22.6)[d]
County population of practice area				
Metropolitan (>250,000)	284	77.0 (68.9–83.5)	177	59.1 (39.7–76.0)
Nonmetropolitan (<249,999)	92	23.0 (16.5–31.2)	39	40.9 (24.0–60.3)

CI, confidence interval.

[a] The National Ambulatory Medical Care Survey collects data from general/family practice office-based providers; the National Hospital Ambulatory Medical Care Survey collects data from general medicine hospital outpatient departments; [b] Midlevel provider: physician assistants, nurse practitioners, and certified nurse midwives; only from the Community Health Center sample; [c] Unknown/missing/blank, <10%; included in the analysis but not presented in this Table; [d] Unstable estimates; relative standard error, ≥30% (standard error percent divided by estimated percent × 100); [e] Responses from midlevel providers were excluded in the analysis for this variable; [f] Responses from midlevel providers were included in the analysis for this variable; [g] Geographic region of practice was based on defined US Census Regions.

Roland. HPV co-testing and screening intervals. Am J Obstet Gynecol 2011.

pling weights and account for stratified survey design in our analysis. CCSS sample sizes are small and therefore results are limited to descriptive analysis only. We computed weighted percentages and 95% CIs to examine demographic variables that were related to providers and their screening and co-testing practices and stratified by setting (office-based vs hospital OPD). We further stratified our analysis by obstetrics/gynecology vs other primary care specialties within the setting because we are interested in cervical screening practices according to provider specialty. In NAMCS analysis, the non–obstetrics/gynecology category included general/family practice, internal medicine, and midlevel CHC providers. In NHAMCS analysis, non–obstetrics/gynecology specialty included general medicine clinics only. Relative standard error (calculated as the standard error percent divided by the estimated percent × 100) ≥30% is considered unstable and should be interpreted cautiously. Additionally, estimates based on <30 sample cases are also considered to be unreliable.

RESULTS

Provider and practice characteristics

The most common specialty for private office-based providers was general/family practice, followed by obstetrics/gynecology, and internal medicine (Table 1). Most providers were 35-54 years old, male, white non-Hispanic, a US medical school graduate, and worked either in a small group (3-5 physicians) or in solo practice. The South and metropolitan areas represented the highest percentage of private office-based providers to be sampled.

Among the hospital OPDs to be sampled, most providers practiced general medicine (Table 1). Again, the South and metropolitan areas represented the highest percentage of OPD locations sampled.

Type of Papanicolaou test used to screen for cervical cancer

Liquid-based cytologic testing was the most common cervical cancer screening method to be ordered among both office-based providers (58.9%; 95% confidence interval [CI], 51.6–65.9%) and hospital OPD providers (70.1%; 95% CI, 58.7–79.5%), followed by the use of both conventional Papanicolaou and liquid-based cytologic tests among office-based and hospital OPD providers, respectively (21.9%; 95% CI, 16.8–28.2%; and 20.8%; 95% CI, 13.2–31.3%; Table 2).

HPV testing practices

Among office-based providers, 78.0% (95% CI, 71.3–83.4%) reported ordering the HPV test; 51.0% (95% CI, 43.2–58.7%) reported ordering the HPV co-test, with 64.1% (95% CI, 52.6–74.1%) ordering the co-test for women ≥30 years old (Table 2).

Of hospital OPDs that were sampled, 84.0% of providers (95% CI, 65.1–93.7%) reported ordering the HPV test, with similar percentages stratified by specialty. More than one-half of hospital OPDs (51.4%; 95% CI, 39.0–63.6%) reported ordering the HPV co-test; of those, 62.4% (95% CI, 46.1–76.4%) ordered the co-test for women ≥30 years old.

Screening interval recommendations

Among office-based providers and hospital OPDs that order the HPV test, most providers in both settings would perform the next Papanicolaou test in 12 months for all 3 clinical vignettes (Table 3).

For a woman between 30 and 60 years old with a current normal Papanicolaou test result, no current HPV test result, and 2 consecutive normal Papanicolaou test results, 76.4% of office-based providers (95% CI, 69.3–82.3%) and 85.2% of hospital OPDs (95% CI, 72.6–92.6%) would recommend a next screening in 12 months (Table 3).

TABLE 2
Cervical cancer screening practices, by setting and specialty: Cervical Cancer Screening Supplement, 2006

Variable	Percentage of office-based providers (95% CI)			Percentage of hospital outpatient departments (95% CI)		
	Obstetrics/ gynecology	Not obstetrics/ gynecology[a]	Total	Obstetrics/ gynecology	Not obstetrics/ gynecology[b]	Total
Which of the following methods does your practice use to screen patients for cervical cancer?						
Total, n[c]	90	281	371	108	103	211
Conventional Papanicolaou test	0.9 (0.1–6.3)[d]	26.1 (18.8–34.9)	19.2 (13.9–25.8)	12.8 (4.9–29.3)[d]	7.8 (2.7–20.4)[d]	9.0 (4.2–18.3)[d]
Liquid-based cytologic test	75.3 (64.1–83.9)	52.7 (43.6–61.6)	58.9 (51.6–65.9)	68.7 (53.1–80.9)	70.6 (56.5–81.6)	70.1 (58.7–79.5)
Both conventional Papanicolaou and liquid-based cytologic test	23.8 (15.3–34.9)	21.3 (15.2–28.9)	21.9 (16.8–28.2)	18.6 (10.7–30.4)	21.6 (12.3–34.9)	20.8 (13.2–31.3)
Does your practice ever order or collect the human papillomavirus test?						
Total, n[e]	89	272	361	106	99	205
Yes	100.0	69.7 (61.0–77.1)	78.0 (71.3–83.4)	85.2 (68.7–93.7)	83.6 (57.5–95.1)	84.0 (65.1–93.7)
No	0	30.4 (22.9–39.0)	22.1 (16.6–28.7)	14.9 (6.3–31.3)[d]	16.4 (4.9–42.5)[d]	16.0 (6.3–34.9)[d]
If yes, does your practice ever order or collect the human papillomavirus co-test?						
Total, n[f]	87	202	289	94	77	171
Yes	56.2 (43.3–68.2)	47.9 (38.3–57.6)	51.0 (43.2–58.7)	63.9 (49.0–76.6)	46.7 (31.8–62.3)	51.4 (39.0–63.6)
No	43.9 (31.8–56.7)	52.1 (42.4–61.7)	49.0 (41.3–56.8)	36.1 (23.4–51.0)	53.3 (37.7–68.2)	48.6 (36.4–61.0)
If yes, for which patient does your practice order or collect the human papillomavirus co-test?						
Total, n	32	57	89	36	19[g]	55
Women ≥30 y old[h]	71.7 (55.7–83.7)	58.6 (43.6–72.2)	64.1 (52.6–74.1)	75.3 (54.8–88.4)	55.9 (35.0–74.9)	62.4 (46.1–76.4)

CI, confidence interval.

[a] Not obstetrics/gynecology: general/family practice, internal medicine, and midlevel provider; [b] Not obstetrics/gynecology: general medicine; [c] "Unknown" and "blank" responses were excluded in analysis; [d] Unstable estimates; relative standard error, ≥30% (standard error percent divided by estimated percent × 100); [e] "Not aware of human papillomavirus test" and "unknown" responses were excluded in analysis; [f] "Unknown", "blank", and "not applicable" responses were excluded in analysis; [g] n < 30, unstable estimate; [h] This question included a total of 5 non-mutually exclusive response categories that included "women under 30 years old," "women who request the test for cervical cancer screening," " women who request the test to check their human papillomavirus infection status," and "other."

Roland. HPV co-testing and screening intervals. Am J Obstet Gynecol 2011.

For a woman between 30 and 60 years old with a current normal Papanicolaou test result, a current negative HPV test result, and 2 consecutive normal results on Papanicolaou tests, 66.6% of office-based providers (95% CI, 59.1–73.4%) and 72.7% of hospital OPDs (95% CI, 57.8–83.8%) would recommend a next Papanicolaou test in 12 months. Notably, only 14% of office-based providers (95% CI, 9.2–20.6%) would recommend a next Papanicolaou test in ≥3 years, as guidelines recommend (Table 3).

For a woman between 30 and 60 years old with a current normal Papanicolaou test result, a current negative HPV test result, no Papanicolaou test results in the previous 5 years, 73.4% of office-based providers (95% CI, 63.3–81.5%) and 73.5% of hospital OPDs (95% CI, 63.1–81.8%) would recommend a next Papanicolaou test in 12 months. A large percentage of office-based providers (25.2%; 95% CI, 17.8–34.4%) and hospital OPDs (24.9%; 95% CI, 16.6–35.6%) recommend a next Papanicolaou test within a 12-month period (Table 3).

Comment

Through clinical vignettes, we found recommendations to extend the screening interval to 3 years among office-based providers were greatest, albeit 14%, for a woman with a current normal HPV co-test result and a documented history of normal Papanicolaou test results. However, recommendation for next Papanicolaou test within a period of less than 12 months was greatest for a woman with a current normal HPV co-test result but with no documented history of normal Papanicolaou test results in the previous 5 years. Establishing a history of normal Papanicolaou test results with the patient appears to be a critical component to providers making guideline-supported screening interval recommendations. Approximately one-half of providers ordered the HPV co-test for their patients; of those providers, approximately two-thirds ordered the test for women ≥30 years old, which is the only approved use of the HPV co-test.

The findings from our study draw attention to 2 current issues in cervical cancer screening, which are not necessarily mutually exclusive: integration of new screening technologies into practice

TABLE 3
Screening interval recommendations by setting and specialty: Cervical Cancer Screening Supplement, 2006

When should a woman 30-60 years old receive her next Papanicolaou test, given she has:	Percentage of office-based providers (95% CI)			Percentage of hospital outpatient departments (95% CI)		
	Obstetrics/ gynecology	Not obstetrics/ gynecology[a]	Total	Obstetrics/ gynecology	Not obstetrics/ gynecology[b]	Total
A current normal Papanicolaou result, no current human papillomavirus test result, and 2 consecutive previous normal Papanicolaou results in the past 5 years						
Total[c]	83	200	283	89	74	163
0 to <12 mos	1.6 (0.4–6.6)[d]	1.4 (0.4–4.6)[d]	1.5 (0.6–3.7)[d]	8.8 (1.9–31.9)[d]	0	2.3 (0.5–10.3)[d]
12 mos	92.2 (84.8–96.2)	68.0 (58.3–76.3)	76.4 (69.3–82.3)	82.7 (64.9–92.5)	86.1 (69.1–94.5)	85.2 (72.6–92.6)
24 mos	3.5 (1.2–9.8)[d]	23.0 (15.6–32.5)	16.2 (11.1–23.0)	6.0 (1.9–17.2)[d]	7.0 (1.9–22.2)[d]	6.7 (2.5–17.2)[d]
≥36 mos	2.7 (0.7–10.2)[d]	7.7 (3.8–15.0)[d]	5.9 (3.1–11.0)[d]	2.6 (0.9–7.3)[d]	6.9 (2.1–20.5)[d]	5.8 (2.0–15.6)[d]
A current normal Papanicolaou result, a current negative human papillomavirus test result, and 2 consecutive previous normal Papanicolaou results in the past 5 years						
Total[c]	82	196	278	88	75	163
0 to <12 mos	0	0.4 (0.06–2.8)[d]	0.3 (0.04–1.9)[d]	4.9 (1.6–14.0)[d]	0.6 (0.09–4.5)[d]	1.7 (0.5–5.5)[d]
12 mos	78.2 (67.4–86.2)	60.4 (50.7–69.3)	66.6 (59.1–73.4)	76.4 (61.9–86.5)	71.4 (52.3–85.1)	72.7 (57.8–83.8)
24 mos	10.8 (5.4–20.4)[d]	23.7 (16.1–33.4)	19.2 (13.6–26.4)	7.1 (2.6–17.9)[d]	16.0 (6.8–33.2)[d]	13.8 (6.6–26.6)[d]
≥36 mos	11.0 (5.6–20.5)[d]	15.6 (9.3–24.8)	14.0 (9.2–20.6)	11.7 (5.2–24.1)[d]	11.9 (4.9–26.3)[d]	11.9 (5.7–23.2)[d]
A current normal Papanicolaou result, a current negative human papillomavirus test result, and no Papanicolaou test history in the past 5 years						
Total[c]	75	192	267	78	71	149
0 to <12 mos	18.2 (10.3–30.1)	28.7 (19.5–40.1)	25.2 (17.8–34.4)	18.0 (9.8–30.7)	27.1 (16.4–41.3)	24.9 (16.6–35.6)
12 mos	81.8 (69.9–89.7)	69.1 (56.5–79.4)	73.4 (63.3–81.5)	77.9 (64.0–87.5)	72.1 (58.1–82.7)	73.5 (63.1–81.8)
24 mos	0	2.0 (0.3–10.8)[d]	1.3 (0.2–7.3)[d]	0	0.8 (0.1–5.6)[d]	0.6 (0.09–4.2)[d]
≥36 mos	0	0.2 (0.03–1.2)[d]	0.1 (0.02–0.8)[d]	4.1 (0.9–16.9)[d]	0	1.0 (0.2–4.4)[d]

CI, confidence interval.

[a] Not obstetrics/gynecology: general/family practice, internal medicine, and mid-level provider; [b] Not obstetrics/gynecology: general medicine; [c] "No follow-up needed," "no experience with this type of patient," and "blank" were excluded from the analysis; [d] Unstable estimates; relative standard error, ≥30% (standard error percent divided by estimated percent × 100).

Roland. HPV co-testing and screening intervals. Am J Obstet Gynecol 2011.

and adoption of and adherence to clinical guidelines. The uptake of the HPV co-test that is reflected in our findings from 2006 is not necessarily unreasonable because approval from the US Food and Drug Administration and support from professional organizations for HPV co-testing occurred 3 years earlier in 2003. However, our findings that large numbers of providers are not following screening interval recommendations cause greater concern, because support for extending the interval with the Papanicolaou test alone predates the introduction of the HPV test into clinical practice.[7,23]

If providers are using the HPV co-test approach, traditional risk factors (such as the previous number of normal Papanicolaou test results[9]) may not matter as much as HPV status in the determination of screening intervals.[14,24] The HPV test is a risk stratifier; the utility of the HPV test is to identify women with high-risk HPV who are then at risk for having or experiencing precancerous or cancerous changes (CIN 2 or 3 lesion) within the 3 years after the initial testing.[6,25] Use of the HPV co-test and adherence to the extended screening interval guideline with concurrent normal test results circumvents patient harms that can be caused by over-testing, which include pain, inconvenience, and morbidity that is associated with testing, follow-up procedures, and treatments.[26] Frequent and inappropriate use of cervical cancer screening technologies also burdens the patient and practice with unnecessary financial costs.

Continuing medical education on the natural history of HPV, the function of the HPV test, and the implications of the co-test approach on patterns of patient care is available to providers.[27] However, education or access to education may

not be enough to change the individual's clinical behaviors. Public health leadership can promote quality improvement and systems change interventions to ensure that the recommended screening practices are used in clinical settings.[28] However, an organized and systematic approach to screening that promotes these evidence-based screening policies may also be necessary to ensure the screening of women at appropriate intervals.

There were inherent strengths and limitations to our analysis. A large percentage of the surveys were completed by "other office staff" who did not identify as a physician, midlevel provider, or registered nurse (20% in office settings and 31% in hospital OPDs), which may impact the accuracy of the findings. This may present an unexplored bias; it is not a common practice in national survey methods to assess the professional background of the survey respondent. This is an area that may garner research interest in the future. These data validate findings from a recent analysis of primary care provider HPV co-testing and intended screening interval practices[14] and are meant to be representative of general population practices. In addition, clinical vignettes are a useful and reliable method to measure outpatient physician practices.[29-31] However, these estimates are descriptive and, because of the smaller sample size, have resulted in large variances.

Whether HPV co-testing and extended screening intervals will be universally accepted and implemented as current guidelines recommended is unknown.[32] The need to document the adoption of screening technologies and guideline adherence of providers in the midst of changes in health care, evolving screening guidelines, and technology development is of great public health importance. Our findings suggest a need for continued surveillance and data collection on adherence to cervical screening guidelines, and perhaps an open dialogue on provider, patient, and systems preferences for prevention and management of cervical cancer and abnormalities. It is necessary to establish a solid baseline of provider behaviors regarding changes to practice and screening technologies to better understand how policy established at the national level is translated to the individual patient and associated outcomes. Understanding discordance between clinical policy and practice, which can result in unnecessary testing costs and burden to the woman, should be central to future research initiatives. ■

ACKNOWLEDGMENT

We would like to thank David Woodwell, MPH, National Center for Health Statistics, Division of Health Care Statistics, Ambulatory and Hospital Care Statistics Branch for his significant contribution to the management of the Cervical Cancer Screening Supplement.

REFERENCES

1. Cannistra SA, Niloff JM. Cancer of the uterine cervix. N Engl J Med 1996;334:1030-8.
2. Bosch FX, Lorincz A, Munoz N, Meijer CJ, Shah KV. The causal relation between human papillomavirus and cervical cancer. J Clin Pathol 2002;55:244-65.
3. Munoz N, Bosch FX, de Sanjose S, et al. The causal link between human papillomavirus and invasive cervical cancer: a population-based case-control study in Colombia and Spain. Int J Cancer 1992;52:743-9.
4. Walboomers JMM, Jacobs MV, Manos MM, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. J Pathol 1999;189:12-9.
5. American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 109: cervical cytology screening. Obstet Gynecol 2009;114:1409-20.
6. Cox JT. Human papillomavirus testing in primary cervical screening and abnormal Papanicolaou management. Obstet Gynecol Surv 2006;61(suppl):S15-25.
7. Saslow D, Runowicz CD, Solomon D, et al. American Cancer Society guideline for the early detection of cervical neoplasia and cancer. CA Cancer J Clin 2002;52:342-62.
8. Wright TC Jr, Schiffman M, Solomon D, et al. Interim guidance for the use of human papillomavirus DNA testing as an adjunct to cervical cytology for screening. Obstet Gynecol 2004; 103:304-9.
9. Cooper CP, Saraiya M, McLean TA, et al. Report from the CDC: Pap test intervals used by physicians serving low-income women through the National Breast and Cervical Cancer Early Detection Program. J Womens Health (Larchmt) 2005;14:670-8.
10. Holland-Barkis P, Forjuoh SN, Couchman GR, Capen C, Rascoe TG, Reis MD. Primary care physicians' awareness and adherence to cervical cancer screening guidelines in Texas. Prev Med 2006;42:140-5.
11. Meissner HI, Tiro JA, Yabroff KR, Haggstrom DA, Coughlin SS. Too much of a good thing? Physician practices and patient willingness for less frequent Pap test screening intervals. Med Care 2010;48:249-59.
12. Saint M, Gildengorin G, Sawaya GF. Current cervical neoplasia screening practices of obstetrician/gynecologists in the United States. Am J Obstet Gynecol 2005;192:414-21.
13. Yabroff KR, Saraiya M, Meissner HI, et al. Specialty differences in primary care physician reports of Papanicolaou test screening practices: a national survey, 2006 to 2007. Ann Intern Med 2009;151:602-11.
14. Saraiya M, Berkowitz Z, Yabroff KR, Wideroff L, Kobrin S, Benard V. Cervical cancer screening with both human papillomavirus and Papanicolaou testing vs Papanicolaou testing alone: what screening intervals are physicians recommending? Arch Intern Med 2010;170: 977-85.
15. Cherry DK, Hing E, Woodwell DA, Rechtsteiner EA. National Ambulatory Medical Care Survey: 2006 summary. Natl Health Stat Report 2008;3:1-39.
16. Hing E, Hall MJ, Xu J. National Hospital Ambulatory Medical Care Survey: 2006 outpatient department summary. Natl Health Stat Report 2008;4:1-31.
17. Centers for Disease Control and Prevention, National Center for Health Statistics. Cervical cancer screening supplement. Available at: http://www.cdc.gov/nchs/data/ahcd/namcsCCS-2006.pdf. Accessed Feb. 24, 2011.
18. Office of Management and Budget Standards and Guidelines for Statistical Surveys. Response rate calculations, section 3.2, page 15. Available at: http://www.whitehouse.gov/sites/default/files/omb/inforeg/statpolicy/standards_stat_surveys.pdf. Accessed Feb. 24, 2011.
19. American College of Obstetricians and Gynecologists. ACOG committee opinion no. 431: routine pelvic examination and cervical cytology screening. Obstet Gynecol 2009; 113:1190-3.
20. Cox JT. The clinician's view: role of human papillomavirus testing in the American Society for Colposcopy and Cervical Pathology guidelines for the management of abnormal cervical cytology and cervical cancer precursors. Arch Pathol Lab Med 2003;127:950-8.
21. Smith RA, Cokkinides V, Brawley OW. Cancer screening in the United States, 2009: a review of current American Cancer Society guidelines and issues in cancer screening. CA Cancer J Clin 2009;59:27-41.
22. Wright TC Jr, Massad LS, Dunton CJ, Spitzer M, Wilkinson EJ, Solomon D. 2006 consensus guidelines for the management of women with abnormal cervical screening tests. J Low Genit Tract Dis 2007;11:201-22.
23. American College of Obstetricians and Gynecologists. ACOG practice bulletin, no. 45: cervical cytology screening. Int J Gynaecol Obstet 2003;83:237-47.
24. Castle PE, Sideri M, Jeronimo J, Solomon D, Schiffman M. Risk assessment to guide the prevention of cervical cancer. J Low Genit Tract Dis 2008;12:1-7.

25. Salmeron J, Lazcano-Ponce E, Lorincz A, et al. Comparison of HPV-based assays with Papanicolaou smears for cervical cancer screening in Morelos State, Mexico. Cancer Causes Control 2003;14:505-12.
26. Sawaya GF. Rightsizing cervical cancer screening: comment on "Cervical cancer screening with both human papillomavirus and Papanicolaou testing vs Papanicolaou testing alone." Arch Intern Med 2010;170:985-6.
27. Roland KB, Larkins TL, Benard VB, Berkowitz Z, Saraiya M. Content analysis of continuing medical education for cervical cancer screening. J Womens Health (Larchmt) 2010;19:651-7.
28. Henley SJ, King JB, German RR, Richardson LC, Plescia M. Surveillance of screening-detected cancers (colon and rectum, breast, and cervix): United States, 2004-2006. MMWR Surveill Sum 2010;59:1-25.
29. Dresselhaus TR, Peabody JW, Luck J, Bertenthal D. An evaluation of vignettes for predicting variation in the quality of preventive care. J Gen Intern Med 2004;19:1013-8.
30. Peabody JW, Luck J, Glassman P, Dresselhaus TR, Lee M. Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. JAMA 2000; 283:1715-22.
31. Peabody JW, Luck J, Glassman P, et al. Measuring the quality of physician practice by using clinical vignettes: a prospective validation study. Ann Intern Med 2004;141:771-80.
32. Solomon D, Breen N, McNeel T. Cervical cancer screening rates in the United States and the potential impact of implementation of screening guidelines. CA Cancer J Clin 2007; 57:105-11.