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Cervical cytology screening among low-income, minority adolescents in New York City following the 2009 ACOG guidelines

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Abstract

Objectives—In December 2009, the American College of Obstetricians and Gynecologists recommended cervical cancer screening begin at age 21 for young women. In this study, we examine **receipt** of first lifetime Papanicolaou (Pap) test and predictors of over-screening among adolescents within a large urban ambulatory care network.

Methods—We compared **the proportion** of first lifetime Pap test of adolescents aged 13-20 years between June 2007-November 2009 (n=7700) and December 2009-June 2012 (n=9637) using electronic health records. We employed multivariable regression models to identify demographic and health care factors associated with receiving a first lifetime Pap test at age <21 years in the post-guideline period (over-screening).

Results—**The proportion of** Pap tests declined from 19.3% to 4.2% ($p < 0.001$) between the two periods. Multivariable logistic regression results showed receiving care from gynecology/obstetrics/family planning clinics compared to pediatric clinics, having more clinic encounters, and older age were associated with over-screening in the post-guideline period.

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Conclusions—We found that guideline adherence differed by clinic type, insurance status, and health care encounters. In the quickly evolving field of cervical cancer control, it is important to monitor practice trends as they relate to shifts in population-based guidelines, especially in high-risk populations.

Introduction

In December 2009, the American College of Obstetricians and Gynecologists (ACOG) issued a new recommendation that cervical cytology screening begin at age 21 years, regardless of age at initiation of sexual activity (American Congress of Obstetricians and Gynecologists 2009). These recommendations were based on growing evidence that human papillomavirus (HPV) infections, although highly prevalent among adolescents, are often transient and that cervical dysplasia frequently regresses without intervention in younger individuals (Ho 1998; Moore 2007; Moscicki 2010; Moscicki 1998; Soren 2009). Adverse effects of over-screening (i.e., increased anxiety, overuse of follow-up procedures) were also considered (American Congress of Obstetricians and Gynecologists 2009; Kahn 2007; Kyrgiou 2006).

Multiple cervical cancer screening and management guidelines have been issued over the past decade by numerous organizations, including ACOG, the United States Preventive Services Task Force, American Cancer Society, and American Society for Colposcopy and Cervical Pathology (American Congress of Obstetricians and Gynecologists 2009; Massad 2013; Moyer 2012; Saslow 2007; Saslow 2002; Wright 2007). Until recently, screening guidelines were inconsistent for patients under age 21 years. Recommendations to delay initial screening until age 21 were issued at different time points, potentially confusing practitioners about best practices. Prior studies examining adherence to the 2006 recommendations for conservative management of abnormal Pap results, however, found reduced colposcopy referrals as a measure of provider adherence (Anderson 2011; Fauci 2011; Perkins 2012). Less is known about provider adherence, including associated factors, to the recommendation to delay initial screening until 21 years. Two recent studies found a decline in Pap testing rates among young women following the 2009 guidelines, but data relied on patient self-report from national cross-sectional surveys rather than health records containing screening information (Henderson 2013; Roland 2013).

It is particularly important to examine provider screening practices of sexually active adolescent girls from low-income communities, which may differ from guideline recommended standards since these patients may be at higher risk for HPV infection and cervical cancer (Benard 2011). In this study, we use electronic health record (EHR) data to **compare receipt** of first lifetime Pap test before and after the 2009 ACOG guidelines **within a large urban ambulatory care network** and **correlates of Pap testing** before 21 years of age. We hypothesize that **the percentage of Pap tests** will be lower in the post-guideline period, but adherence will not be consistent across subgroups.

Materials and Methods

We conducted a retrospective pre-post cohort study of adolescent females to compare **proportions** of first lifetime Pap test before and after the 2009 ACOG Cervical Cytology Screening guidelines. Subjects received care from **all community-based pediatric primary care**, family medicine, family planning, obstetrics/gynecology, and school-based health clinics within a large academically-affiliated ambulatory care network in northern Manhattan. Residents in this community are predominantly Latino, Spanish-speaking, and foreign-born (New York City Department of City Planning 2012).

We defined pre- and post-guideline periods as the 2.5 years before (June 2007-November 2009) and after (December 2009-May 2012) issuance of the new guidelines, as the ACOG bulletin was released on December 1, 2009 (American Congress of Obstetricians and Gynecologists 2009). We chose to focus on the implementation of the 2009 ACOG guidelines as opposed to similar guidelines issued in 2012 by the U.S. Preventive Services Task Force and the American Cancer Society because the majority of practitioners at all clinic sites within the ambulatory care network routinely abide by ACOG guidelines. Eligible subjects were: 1) 13-20 years at any point during the period of interest, 2) had 1 visit at an aforementioned site during the period of interest, and 3) had no prior Pap tests at study period initiation. Some subjects fulfilled inclusion criteria for both study periods. Subjects who received a first lifetime Pap test during the pre-guideline period were excluded from the post-guideline period. This study was approved by the Columbia University Medical Center Institutional Review Board.

Measures

We employed the Andersen Behavioral Model for health services utilization to identify appropriate covariates that were available in the data for screening guideline adherence (Andersen 1995).

Demographic & health care characteristics—Demographic (age, race, language) and health care information (insurance status, clinic visit dates, clinic type) were obtained from hospital billing and registration systems. We used the primary insurance type for each patient at time of last visit to a study site. Insurance status included public, private, grant-based, and uninsured categories. Grant-based insurance (Title X for family planning and state-funded grants for school based clinic) was used for select visits to those sites if patients were not publically insured. Age was measured continuously and categorically (13-15 years, 16-20 years). Race was categorized as white, black, and other. Language was categorized as Spanish and English/Other Language. We used clinic setting at the time of last visit to designate clinic type. Number of clinic visits within each period served as a proxy for health care encounter frequency. Clinic visits occurring before the 13th birthday or on/after the 21st birthday during the study period were not included.

Cervical cytology screening—Pap testing information was obtained from EHRs. Our primary outcome was receipt of first lifetime Pap test <21 years, as determined by patient age at first Pap test reported in the EHR; this was considered to be over-screening in the post-guideline period. Mean number of Pap tests during the period of interest was calculated

for subjects who received a first Pap test during that period. For those who aged in/out of the cohort, first Pap was only included if it occurred on/after the 13th birthday or before the 21st birthday.

STI testing history—Sexually transmitted infections (STI) testing history for chlamydia or gonorrhea was obtained from EHRs. STI testing during the study period and abnormal STI test results were used as proxies for sexual activity.

HPV vaccination—HPV vaccine data were obtained from the hospital and NYC immunization registries. The hospital immunization registry historically has captured approximately 95% of vaccines administered to children/adolescents within the hospital and affiliated clinics (Verani 2007) and now automatically captures all vaccine administrations through the EHR (Vawdrey 2013). This registry also reports to and receives data from the city immunization registry, a population-based provider-mandated registry for those aged 18 year or younger in NYC (Metroka 2009). We categorized HPV vaccine initiation as receipt of 1 dose and completion as having received all three doses.

Statistical Analysis

We examined **proportions** of first Pap test by demographic characteristics, health care factors, HPV vaccination history and STI testing history. **The proportion of first Pap tests** were calculated from the number of subjects who received their first test compared to the total number of subjects in each period. **Proportions** were compared before and after the new guidelines. We used McNemar's chi-squared test for non-independent samples to test for significant differences in **percentage of** first lifetime Pap test within each demographic and health care subgroup between the two guideline periods. Multivariable logistic regression was used to identify factors associated with over-screening in the post- guideline period. As a sub-analysis, we also examined **receipt** of first Pap test >21 years among those who turned 21 during the study period and had not yet received a first Pap. Statistical analyses were conducted using STATA version 12 (StataCorp, College Station, Texas).

Results

Of the 17,337 patients in the study cohort, 44% (n=7,700) were included in the pre-guideline period and 56% (n=9,637) were included in the post-guideline period. A total of 2,586 patients fit the eligibility criteria for both study periods. Demographic and health care characteristics of adolescent girls and young women were similar between the two study periods (Table 1). Mean age was approximately 15 years in both groups. The majority were Spanish speaking, “other” race, and publicly insured. Most received care in a pediatric, family planning, or school-based health clinic. On average, subjects had 5 and 6 visits in the pre- and post-guideline periods, respectively. Rates of HPV vaccine initiation and completion were notably higher during the post-guideline period.

The number of first lifetime Pap tests declined after December 2009 (Figure 1). **The proportion** of first lifetime Pap test in girls <21 years decreased from 19.3% in the pre-guideline period to **4.2%** in the post-guideline period (15.1% absolute decline; 78% relative difference) (Table 1). **A lower proportion of** first lifetime Pap test was observed among all

subgroups in the post-guideline vs. pre-guideline period. However, **more girls who were** uninsured (13.6%), received care from a gynecologic or obstetric clinic (17.6%), or had 5 clinic visits during that period (11.3%) received first Pap tests at age < 21 years compared to girls in other subgroups in the post-guideline period. Nonetheless, these same subgroups also experienced some of the largest absolute declines in Pap testing between the pre- and post-guideline periods. For example, **the proportion of Pap tests** declined from 48.1% to 17.6% (30.5% absolute difference) among those in gynecology/obstetrics clinics.

Age, Spanish language, being uninsured, clinic type, number of clinic visits, HPV vaccination history, and having a prior positive STI test were significant predictors of over-screening in the post-guideline period in the unadjusted analysis (Table 3). Prior positive STI test was collinear with over-screening in the post-guideline period (i.e. nearly all subjects with a prior positive STI test received a Pap test at age < 21 years) and omitted from the multivariable model. After adjusting for demographic and health care characteristics, older (16-20 years) vs. younger (13-15 years) girls remained more likely (OR 5.91, 95% CI: 3.81, 9.12) to be over-screened in the post-guideline period. Girls receiving care from gynecologic/obstetrics/family planning (OR 4.27, 95% CI: 2.96, 6.16) or family medicine (OR 2.79, 95% CI: 1.55, 5.01) clinics were more likely to be over-screened in the post-guideline period compared to girls receiving care from pediatric clinics, whereas girls receiving care from school-based health clinics were significantly less likely to be over-screened. Girls lacking insurance were more likely to be over-screened than those with private insurance.

In our sub-analysis of young women who turned 21 years during the study period without having yet had a first Pap test (pre-guideline period: n=1,143; post-guideline period: n=1,565), 65% received a first Pap test between ages 21-23 years during the pre-guideline period vs. 32% during the post-guideline period. HPV vaccine completion status did not impact receipt of a first Pap test in the post-guideline period for this age group.

Discussion

Our study is among the first to examine **Pap screening** among low-income, minority adolescent girls **under age 21** using EHR information following the 2009 ACOG recommendation to delay initial cervical cancer screening until age 21. We observed a substantial decline in overall **proportions of** first Pap testing among adolescents girls <21 years in the post-guideline period. This decline is consistent with more limited studies using self-reported survey data to monitor Pap testing rates among adolescents and young women in the past decade (Henderson 2013; Roland 2013). Although these other studies reported either similar or smaller absolute declines (10-12% vs. 14%) in Pap testing, our study uses EHRs to examine a larger proportion of urban, minority adolescent girls from a wider age range that may be more sensitive to changes in screening practices given the higher perceived risk of cervical cancer and sexually transmitted infections.

While the decline in first lifetime Pap testing rates provides positive evidence for guideline-adherent screening practices, we found that those who were seen in gynecology, obstetrics or family planning clinics or with more clinic visits were more likely to be over-screened,

suggesting guideline adherence differs by health care characteristics and physician specialties. In the past, new guidelines calling for reduced screening for other cancers have been met with resistance by the public and some practitioners. A study surveying obstetricians-gynecologists after the 2009 ACOG guidelines were issued showed that only half of physicians adhered to the recommendations to begin screening at age 21 years (Perkins 2013). Higher Pap testing rates among girls receiving care from obstetrics and gynecology clinics in this study corroborate these findings. Conversely, HPV-vaccinated young women were less likely to be over-screened if <21 years, which may reflect greater provider adherence to all practice-based guidelines (i.e., ACIP and ACOG) or possibly perceptions of patient risk. Over-screening of uninsured girls in the post-guideline period may be indicative of opportunistic screening of populations with sporadic health care and lack of knowledge related to screening guidelines (Hawkins 2013; Roland 2013).

Increased provider and patient knowledge about guideline-recommended screening and the minimal benefit of screening under age 21 are needed. Provider-oriented interventions to improve guideline adherence may include the use of clinical decision support aids within electronic medical record systems, prompting appropriate guideline-recommended screenings for each patient, as well as provider assessment and feedback programs that evaluate the practice of over-screening young women under age 21 (Community Preventive Services Task 2012; Yabroff 2011). Patient-oriented interventions to improve knowledge around appropriate screening age may include tailored group or one-on-one educational sessions from health care practitioners or community health educators. Other effective interventions may include the use of tailored media, such as print materials for parents of adolescent girls or internet-based information for adolescents (Community Preventive Services Task 2012).

A smaller proportion of young women ages 21-23 **received Pap tests** in the post-guideline period. While these women should have received their first Pap test beginning at age 21, a large proportion remained unscreened. These exploratory findings suggest screening practices for delaying Pap initiation may inadvertently carry over into older age groups within the same clinic population. Conversely, HPV vaccination completion did not impact screening behavior practices in this older age group, which may allay concerns that guideline-adherent screening practices may be negatively influenced by HPV vaccination status (Anhang Price 2011; Bauch 2010; Tiro 2008). A closer examination of factors associated with adherence to recommended screening guidelines among young women age 21 and older is warranted.

Some study limitations should be noted. First, this analysis only included EHR data from **clinics within** one ambulatory care network. Thus, we cannot account for care received outside of the network. Second, while we controlled for clinic type in the analysis, it is unclear whether variation in screening adherence is due to clinic- or physician-level differences. Clinic type was also based on most recent visit rather than the most frequently visited clinic setting. However, patient demographics within each clinic type remained similar during the study period. Additionally, in contrast to prior studies (Henderson 2013; Roland 2013), we did not find race to be associated with non-guideline adherent screening. Our findings may relate to categorization of many minority patients as “Other” race and the

high proportion of missing ethnicity data. Lastly, reasons for receiving a Pap test or STI test are unknown and not available in the EHRs. The data, however, were not subject to the self-reporting bias present in similar studies examining screening guideline adherence.

In the quickly evolving field of cervical cancer control, it will be important to examine practice trends as they relate to shifts in population-based guidelines, especially for high-risk populations. In this study, we observed a promising trend towards a decline in Pap testing among patients under age 21 years, but also an indication that subgroup differences in screening guideline adherence exist. In the era of healthcare reform, the implementation of pay for performance programs and cost containment efforts as well as a strong emphasis on prevention and the US Preventive Services Task Force recommendations may further improve adherence to cervical cancer screening guidelines (Moy 2011). It is important to eliminate unnecessary medical tests, especially since disclosure and follow-up of abnormal screening results can lead to adverse effects, including additional health care utilization and cost, that could otherwise be prevented (Kim 2013). Furthermore, the need to balance screening and effective care while minimizing overtreatment for low-income populations that may often lack routine medical visits and are at greatest risk for cervical cancer should continue to be monitored.

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Highlights

- Examined receipt of first lifetime Pap test before/after the 2009 ACOG guidelines
- Proportion of first lifetime Pap test declined significantly
- Site of care, insurance status, and older age were associated with over-screening

Figure 1.

Monthly frequencies of first lifetime Pap test among adolescent girls and young women age < 21 years from an ambulatory care network in New York City in the pre- and post-guideline periods (2007-2012).

Table 1

Demographic and health care characteristics of adolescent girls age < 21 years **from the ambulatory care network, New York City**, in the pre- and post-guideline periods (2007-2012).

	Pre-Guideline (n=7700) n (%)	Post-Guideline (n=9637) n (%)
<i>Demographic Characteristics</i>		
Age (mean, range) ^a	14.9 (10-20)	15.4 (10-20)
Race		
White	2896 (37.6)	2244 (23.3)
Black	939 (12.2)	897 (9.3)
Other	3865 (50.2)	6496 (67.4)
Language		
Spanish	3836 (55.9)	5176 (57.8)
English	2988 (43.5)	3717 (41.5)
Other Language	42 (0.6)	62 (0.7)
<i>Health Care Characteristics</i>		
Insurance Type		
Private	293 (3.8)	321 (3.3)
Public	5317 (69.1)	7008 (72.7)
Grant-based	1736 (22.6)	2034 (21.1)
Uninsured	354 (4.6)	272 (2.8)
Clinic Type		
Pediatrics	1861 (24.2)	2985 (31.0)
Gynecology/Obstetrics	1343 (17.4)	1440 (15.0)
Family Planning	1935 (25.1)	2091 (21.7)
Family Medicine	292 (3.8)	335 (3.5)
School-based Clinic	2269 (29.5)	2783 (28.9)
<i>Clinical Characteristics</i>		
Clinic Visits (mean, range)	5.4 (1-58)	5.2 (1-92)
Clinic Visits ^b		
1	1604 (22.5)	2055 (22.9)
2-4	2568 (36.0)	3521 (39.3)
5+	2491 (34.9)	2963 (33.0)
HPV Vaccine Initiation (1 dose) ^c		
Yes	4653 (60.4)	7513 (77.9)
No	3047 (39.6)	2124 (22.0)
HPV Vaccine Completion (3 doses) ^c		
Yes	2295 (29.8)	5240 (54.4)
No	5405 (70.2)	4397 (45.6)
Tested for STI during study period		
Yes	4058 (52.7)	5155 (53.5)
No	3642 (47.3)	4482 (46.5)

	Pre-Guideline (n=7700) n (%)	Post-Guideline (n=9637) n (%)
Ever had an abnormal STI test		
Yes	5415 (70.3)	6362 (64.3)
No	2285 (29.7)	3275 (35.7)
Received 1st Pap Test at age < 21 years		
Yes	1490 (19.3)	405 (4.2)
No	6210 (80.7)	9232 (95.8)

^a Age calculated at beginning of each study period.

^b Only included clinic visits before age 21.

^c Vaccination status by the end of each study period.

Table 2

Percent of first Pap tests by demographic, health care, and clinical **subgroups among** adolescent girls age < 21 years from the **ambulatory care network, New York City**, in the pre- and post-guideline periods (2007-2012).

	% Receiving 1 st Pap test in Pre-guideline period	% Receiving 1 st Pap test in Post-guideline period	% change between periods ^b
	n (%)	n(%)	
<i>Demographic Characteristics</i>			
Age ^a			
13-15	263/1402 (18.8)	25/4904 (0.5)	-18.3
16-20	1220/2936 (41.6)	380/4733 (8.0)	-33.6
Race			
White	458/2896 (15.8)	48/2244 (2.1)	-13.7
Black	105/939 (11.2)	19/897 (2.1)	-9.1
Other	927/3865 (24.0)	338/6496 (5.2)	-18.8
Language			
Spanish	746/3836 (19.4)	242/5176 (6.5)	-12.9
English	628/2988 (21.0)	131/3717 (5.0)	-16.0
Other Language	6/42 (14.3)	2/62 (0.7)	-10.1
<i>Health Care Characteristics</i>			
Insurance Type			
Private	28/293 (9.6)	10/321 (2.8)	-6.8
Public	1132/5317 (21.3)	338/7008 (4.8)	-16.5
Grant-funded	235/1736 (13.5)	31/2034 (1.5)	-12.0
Uninsured	95/354 (26.8)	27/272 (9.9)	-16.9
Clinic Type			
Pediatrics	125/1861 (6.7)	42/2985 (1.4)	-5.3
Gynecology/Obstetrics	646/1343 (48.1)	253/1440 (17.6)	-30.5
Family Planning	574/1935 (29.7)	87/2091 (4.2)	-25.5
Family Medicine	78/292 (26.7)	18/335 (5.4)	-21.3
School-based Clinic	67/2269 (3.0)	5/2783 (0.2)	-2.8
<i>Clinical Characteristics</i>			
Clinic Visits			
1	176/1604 (25.7)	43/2055 (2.7)	-23.0
2-4	299/2568 (22.9)	98/3521 (3.9)	-19.0
5+	378/2491 (28.0)	227/2963 (11.3)	-16.7
Initiated HPV Vaccine	726/4653 (15.6)	260/7513 (3.5)	-12.1
Completed HPV Vaccine	252/2295 (11.0)	146/5240 (2.8)	-8.2
STI test during study period	1328/4058 (32.7)	137/5155 (7.3)	-25.5
Ever had abnormal STI test	1483/5415 (27.4)	404/6362 (6.4)	-21.0

^a Age at beginning of each study period

^b All p-values <0.0001 when comparing **proportion of Pap tests** between pre- and post-guideline periods (McNemar's chi-square statistic for non-independent groups).

Table 3

Multivariable logistic regression model of receiving a first (initial) Pap test before age 21 among adolescent girls from **the ambulatory care network**, New York City, in the post-guideline cohort (over-screening) (n=8950)

	Unadjusted OR (95% CI)	Adjusted OR (95% CI) ^c
<i>Demographic Characteristics</i>		
Age ^a		
13-15	Ref	Ref
16-20	17.0 (11.3, 25.6)	5.91 (3.81, 9.17)
Race		
White	Ref	Ref
Black	0.47 (0.29, 0.75)	1.32 (0.71, 2.46)
Other	2.52 (1.93, 3.25)	0.93 (0.66, 1.32)
Language		
English/Other Language	Ref	Ref
Spanish	1.34 (1.08, 1.67)	1.14 (0.90, 1.43)
<i>Health Care Characteristics</i>		
Insurance Type		
Private	Ref	Ref
Public/Grants	1.54 (0.79, 3.01)	0.51 (0.25, 1.05)
Uninsured	2.62 (1.74, 3.95)	1.90 (1.19, 3.04)
Clinic Type		
Pediatrics	Ref	Ref
Gyn/Ob/Family Planning	9.89 (7.56, 12.9)	4.27 (2.96, 6.16)
Family Medicine	1.31 (0.80, 2.13)	2.79 (1.55, 5.01)
School-based Clinic	0.03 (0.01, 0.07)	0.15 (0.06, 0.40)
# of clinic visits ^b		
1	Ref	Ref
2-4	0.54 (0.43, 0.68)	2.47 (1.69, 3.60)
5+	3.02 (2.45, 3.71)	6.57 (4.66, 9.26)
Completed HPV Vaccine Series	0.46 (0.37, 0.56)	0.74 (0.58, 0.93)
Prior positive STI test	221.99 (31.18, 1580.50)	--

^a Age at beginning of study period, includes girls age 10-12 years who turned 13 during post-guideline period.

^b Only included clinic visits before age 21 within the study period

^c Adjusted model controls for age, race, language, insurance, clinic type, # of clinic types, and HPV vaccination status.