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Original article

Cervical Cancer Screening and Follow-Up Procedures in Women Age <21 Years Following New Screening Guidelines

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A B S T R A C T

Purpose: The 2009 American College of Obstetricians and Gynecologists guidelines recommended no cervical cancer screening before age 21 years. We examined changes in screening, diagnostic, and treatment procedures for cervical dysplasia after guideline introduction, and cost implications.
Methods: We studied Davidson County women aged 18–20 years, enrolled in Tennessee Medicaid, 2006–2014. We identified those with at least one Papanicolaou (Pap) test, human papillomavirus detection test, colposcopy, or excisional dysplasia treatment annually via Current Procedural Terminology coding. We used rate ratios with 95% confidence intervals to compare annual changes in procedure and treatment rates from 2014 to 2006. We counted total outcomes to estimate annual costs based on 2014 average procedural costs.
Results: From 2006 to 2014, about 3,800 Davidson County women aged 18–20 years were enrolled in Medicaid annually. From 2006 to 2014, there were declines in Pap tests from 55.6 to 15.2 per 100 women (rate ratio .27, 95% confidence interval .25–.3); human papillomavirus tests from 13.8 to 5.9 per 100 (.42, .36–.5); colposcopy from 9.4 to 1.1 per 100 (.12, .08–.17); and dysplasia treatment from 1.1 to 0 per 100. The estimated cost of screening and procedures fell from $53 to $8 per enrolled woman, not accounting for changes in visits or complications associated with these procedures.
Conclusions: The 2009 screening guidelines were associated with major declines in screening, diagnostic, and treatment procedures for cervical dysplasia. Minimum estimated procedure and treatment costs saved were $45 per enrolled woman age 18–20 years.

IMPLICATIONS AND CONTRIBUTION

Cervical cancer screening declined in young women aged 18–20 years since introduction of 2009 screening guidelines. From 2006 to 2014, Pap smears and colposcopies declined 73% and 88%, respectively, in young women enrolled in Tennessee's Medicaid program. Results estimated a minimum cost savings of $45 per enrollee.

Conflicts of Interest: The authors have no conflicts of interest to disclose.
Sources of study: Tennessee Bureau of TennCare of the Department of Finance and Administration provided the data.
Disclosures: HPV IMPACT study was approved as public health surveillance and not research by CDC, Vanderbilt, and TN Department of Health IRBs, 45 CFR 164.512.

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Invasive cervical cancer is very rare in women less than 21 years of age [1]; however, minor grade cytology abnormalities are common [2]. Cervical cancer typically results from infection with human papillomaviruses (HPVs). In the United States, genital detection of HPV infections increases through age 24 years and then gradually declines [3]. About 90% of these infections clear in the first two years after acquisition, with regression of accompanying dysplasia [4,5].

Cervical cancer screening modalities include Papanicolaou (Pap) tests to detect abnormal cells and HPV DNA testing to identify oncogenic HPVs [6]. When pre-cancerous lesions are detected, further evaluation may be warranted with colposcopy with or without biopsy. More invasive lesion excision procedures include cryotherapy, loop electrosurgical excision procedure (LEEP), laser ablation, and cold knife conization.

Cervical cancer screening and subsequent treatments have significant immediate risks, including anxiety, stigmatization, pain, bleeding, and small bowel injury [6–10]. Systematic reviews of observational studies have found associations between some treatment procedures and perinatal mortality, preterm birth, low birth weight, premature rupture of membranes, and caesarean delivery [7,8]. Many women who undergo these procedures have other risk factors that independently put them at higher risk of adverse pregnancy outcomes. However, procedure-associated risks appear to be related to the amount and/or depth of tissue removed [9–11]. In addition, miscarriage has been associated with pregnancy timing within 12 months of LEEP procedures, but not later [12].

Given the potential for harms from screening and low risk of invasive cancer in very young women, in 2009, the American College of Obstetricians and Gynecologists recommended the initiation of cervical cancer screening at 21 years of age. In addition, they recommended reduced frequency of screenings in other age groups [13]. In 2012, the US Preventive Services Task Force released guidelines in agreement with those of the American College of Obstetricians and Gynecologists [14].

The first HPV vaccine was licensed in the United States in 2006 and recommended by the Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices in 2007 for routine vaccination of girls age 11–12 years and catch-up vaccination of females 13–26 years. We monitor the incidence of cervical dysplasia in Davidson County (Nashville) women aged 18–39 years as a participating site in CDC's population-based surveillance, HPV-IMPACT [15], designed to evaluate the effectiveness of the HPV vaccination program on reducing cervical dysplasia incidence. Monitoring changes in screening is an important part of this evaluation. Given that screening is no longer recommended for women aged 18–20 years, we aimed to determine how screening has changed in this group of young women. Population-based data on screening were available for our County for women enrolled in Tennessee's Medicaid Program (TennCare), which we used to estimate changes following the new screening guidelines.

Materials and Methods

We performed a retrospective study investigating cervical cancer screening in women 18–20 years of age, who were residents of Davidson County (Nashville), Tennessee, and enrolled in the Tennessee Medicaid program (TennCare). We determined the incidence of Pap smears, HPV DNA testing, colposcopy, and invasive cervical procedures from 2006 to 2014 to determine the impact of the new cervical screening guidelines. Current procedural terminology codes (Table 1) were used to identify and enumerate the frequency of cervical cancer screening and treatment procedures as reflected in TennCare insurance data. The Tennessee Department of Finance and Administration Bureau of TennCare provided the data. This analysis was performed as part of the HPV-IMPACT study [15], a population-based surveillance of HPV-related disease, and thus considered public health surveillance and not human research by the CDC, Vanderbilt, and TN Department of Health institutional review boards. Davidson County, TN, is one of five HPV IMPACT sites that estimates population cervical cancer screening rates and incidence of cervical dysplasia.

Table 1
Current Procedural Terminology (CPT) coding for specific study procedures

Procedure	CPT codes
Pap testing	88141–88143, 88147, 88148, 88150, 88152-88155, 88164–88167, 88174, 88175, G0123, G0124, G0141, G0143-G0145, G0147, G0148, P3000, P3001, Q0091
HPV testing	87621, 87623–87625
Colposcopy	57420–57452, 57454–57456, 57460, 57461
Invasive procedures	
LEEP/LETZ	57461, 57522
Cold knife	57520
Cryotherapy	57511
Ablation or cautery	57513, 57510

The denominator for rate calculations was the number of Davidson County women aged 18–20 years and enrolled in TennCare on July 1 of each year. This method gives an estimate of total person-years of women aged 18–20 years in the population. We counted the number of women with at least one Pap, HPV test, colposcopy, or invasive cervical treatment for dysplasia annually. We also counted total procedures, allowing at most one of each type of procedure per day for each woman enrolled. Screening and treatment procedures (numerators) and estimates of denominators were derived for all women, as well as for non-Hispanic white, non-Hispanic black, and Hispanic women as classified in TennCare data. Women with another designation or unknown race or ethnicity were classified as "other." There were no requirements for continuous enrollment in TennCare for women eligible for this study. We used rate ratios (RRs) to estimate the annual change in procedures performed through 2014 using 2006 as the reference year, and calculated 95% confidence intervals (CIs) using the delta method.

We estimated total and average annual costs for all procedures in 2006 and 2014 using actual payments received by providers in the TennCare program. We also calculated overall median costs for each procedure. This approach is consistent with others using Medicaid-managed care data to estimate costs [16] [17]. We excluded all procedures with payments less than or equal to zero from the calculation. Costs were rounded up to whole values and expressed in 2014 dollars using the medical component of the 2006–2014 Consumer Price Index [18].

Results

There were about 3,800 Davidson County women aged 18–20 years enrolled in TennCare annually over the study period ranging from 3,565 women in 2007 to 4,150 women in 2011. The racial or ethnic distribution remained relatively stable, with overall