Original Research

Guideline-Concordant Surveillance After Treatment for High-Grade Cervical Dysplasia

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OBJECTIVE: To quantify how many patients treated for high-grade cervical dysplasia completed guideline-concordant surveillance.

METHODS: We retrospectively analyzed patients aged 30–65 treated for high-grade cervical dysplasia (cervical intraepithelial neoplasia 2 or worse) at two PROSPR II METRICS (Population-based Research to Optimize the Screening Process Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations sites) (Massachusetts General Brigham, Parkland Health) from 2010 to 2019. The primary outcome was receipt of two negative co-tests after treatment within 30 months (allowing 6-month scheduling leeway).

RESULTS: Among 3,146 patients treated for high-grade dysplasia, most were aged 30–39 years (Massachusetts General Brigham 58.9%, Parkland Health 60.9%) and had no or few known comorbidities (Massachusetts General Brigham 81.2%, Parkland Health 85.6%). Race and ethnicity, insurance status, and socioeconomic status reflected broader patient population demographics. Only half of the patients (45.5%) completed two surveillance co-tests after treatment within 30 months (Massachusetts General Brigham 55.3%, Parkland Health 40.6%), among whom a third received at least one subsequent abnormal co-test result (Massachusetts General Brigham 30.9%, Parkland Health 31.6%). Patients who completed two co-tests were under observation longer than those who did not complete two co-tests (median Massachusetts General Brigham 64.9 months vs 33.1 months, median Parkland Health 63.9 months vs 41.8 months). Among patients who completed two co-tests, the timing of surveillance co-testing was largely concordant with guidelines (median [interquartile range] time to first co-test: Massachusetts General Brigham 6.4 [5.1–9.2] months, Parkland Health 10.1 [6.6–12.6] months; median [interquartile range] time between first and second co-test: Massachusetts General Brigham 8.5 [6.0–12.6] months, Parkland Health 12.0 [8.0–13.5] months). Overall, 16 patients (0.5%) were diagnosed with cervical cancer after treatment for high-grade dysplasia (median [interquartile range] time from treatment to cancer diagnosis 14.9 [3.8–45.9] months).

CONCLUSION: Approximately half of patients did not receive guideline-concordant surveillance after treatment for high-grade dysplasia, and one-third had a subsequent abnormal co-test result. Patients with high-grade cervical dysplasia are at elevated risk of subse-

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PROSPR II data are available for collaboration and sharing after appropriate approvals and agreements are completed. Additional details are provided at https://healthcaredelivery.cancer.gov/prospr/datashare.html.

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quent abnormalities and should continue to be closely monitored. Additional systematic monitoring is needed to ensure guideline-compliant surveillance after dysplasia treatment.

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In the United States from 1999 to 2019, the number of newly diagnosed cases of cervical cancer decreased from 13,914 to 12,795.[1] However, cervical cancer still accounts for about 4,000 deaths each year. High-grade dysplasia (high-grade squamous intraepithelial lesions [HSIL], cervical intraepithelial neoplasia [CIN 2–3], and adenocarcinoma in situ [AIS]) poses the highest risk of progression to cervical carcinoma; in the largest retrospective series of patients followed up for more than 30 years, untreated CIN 3 developed into invasive cancer in more than 30% of patients.[2,3]

The standard treatment for high-grade cervical dysplasia involves excision through loop electrosurgical excision procedure or cone biopsy, which resolves dysplasia in 70–90% of cases.[4,5] After treatment, the 2012 ASCCP guidelines (in place during the study period for this cohort) recommended that patients enter a period of surveillance with two consecutive normal human papillomavirus (HPV)–based test results at 12 and 24 months after HSIL treatment. In cases in which excisions showed HSIL at the margins or in an endocervical curettage (ECC) concurrent with the excision, an additional co-test at 4–6 months after treatment was recommended (acceptable alternatives include repeat excision or hysterectomy). After this initial 24-month period of surveillance, recommendations were for patients to receive co-testing every 3 years for at least 20 years because of an elevated risk of developing cervical cancer. Long-term population studies support this guidance because these patients demonstrate a persistent twofold to fivefold increase in cervical cancer risk after treatment of histologic high-grade dysplasia relative to the general population.[6,7] Concern about the persistent elevation in cervical cancer risk among this population led to the 2019 ASCCP guidelines increasing the frequency of surveillance and recommending co-tests at 6, 18, and 30 months after treatment before a return to 3-year testing.

Guideline-adherent surveillance requires long-term patient engagement in care. Unfortunately, no universal program exists in the United States that crosses the boundaries of health care systems, insurance providers, and other barriers to care delivery. In a statewide surveillance program, fewer than half of women (47.9%) completed biopsies after an HPV16/18–positive test result with normal cytology; most of the remaining women (30.8%) completed no cytologic or histopathologic follow-up within 18 months.[8] Prior studies have shown that more vulnerable populations are less likely to receive guideline-concordant care; for example, one study found that Black and Hispanic patients were less likely to complete a timely cervical biopsy after an abnormal cytologic test result.[9] No prior studies have examined rates of guideline adherence among patients treated for high-grade dysplasia. We used longitudinal cohort data to study timely surveillance delivery in this population at high risk.

METHODS

Data in this study are derived from the METRICS (Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations Research Center), part of the PROSPR II (Population-based Research to Optimize the Screening Process) Consortium.[10] Two health care systems contributed retrospective longitudinal patient data to this analysis: Massachusetts General Brigham, an integrated health care delivery system in the Boston area with two academic medical centers and their affiliated primary care networks, and Parkland Health, a publicly funded, integrated safety net health care system for underinsured and uninsured residents in Dallas County, Texas, with academic oversight from the University of Texas Southwestern Medical Center. The IRBs at both systems approved all study activities.

At Massachusetts General Brigham and Parkland Health, female patients aged 18–89 entered the METRICS cohort at the first visit to a primary care or women's health care clinician within the health care system on or after January 1, 2010; at Parkland Health, patients had to also be a resident of Dallas County. People left the METRICS cohort because of reaching the end of the study period (December 31, 2020), dying, going without a primary care or women's health clinic visit for more than 37 months, or moving out of Dallas County (Parkland Health only).

For the present descriptive study, we included METRICS cohort members who were aged 30–65 years at their first high-grade dysplasia (HSIL, CIN 2–3, or AIS) pathology identified through either diagnostic biopsy (generally a colposcope-directed biopsy or ECC) or a diagnostic treatment (loop electrosurgical excision procedure or cone biopsy) during the 2010–2019 study period (n=4,070; Fig. 1) and excluded those with a history of hysterectomy or

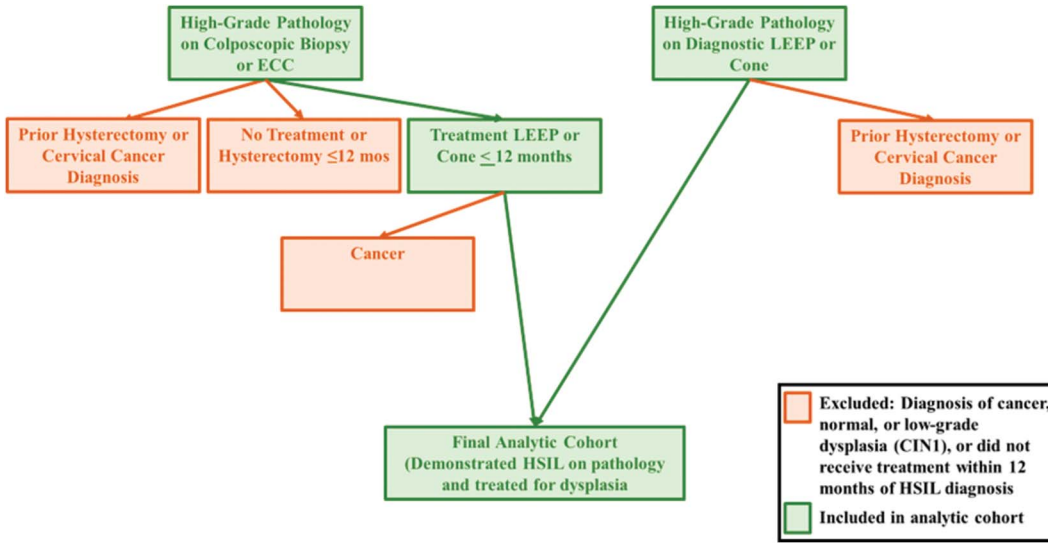

Fig. 1. Study cohort inclusion based on pathology result and treatment completion. ECC, endocervical curettage; LEEP, loop electrosurgical excision procedure; HSIL, high-grade squamous intraepithelial lesion; CIN, cervical intraepithelial neoplasia.

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cervical cancer preceding the high-grade dysplasia pathology (n=190). We then excluded patients according to the procedure at which the high-grade dysplasia was diagnosed as follows:

- Among patients identified through diagnostic biopsy, we excluded those who had a hysterectomy as treatment within 12 months of the high-grade dysplasia (n=33), did not complete a treatment procedure within 12 months (n=651), or were diagnosed with cancer at the treatment procedure (n=50).
- Among patients identified through diagnostic treatment, we did not require completion of an additional treatment procedure for cohort inclusion.

We included patients with AIS who had not undergone hysterectomy within 12 months of excisional procedure to capture any conservatively managed cases of AIS. The final analytic cohort focused on patients who completed a non–hysterectomy treatment procedure within 12 months of the high-grade dysplasia pathology (n=3,146).

Electronic health record and administrative data from all patient encounters within the system and state cancer registries were used to identify demographic information, cytology and HPV tests and results, procedures and pathology results, pregnancy status, and cancer diagnoses as previously described.[11] Given the wide range of patient-level attributes between our study sites, race and ethnicity, health insurance, comorbidity scores, body mass index (BMI, calculated as weight in kilograms divided by height in meters squared), and Yost quintile (geographic location–based index score of socioeconomic status, including housing, education level, income, and unemployment rate) were identified as previously described.[12] Human immunodeficiency virus (HIV) status was identified with diagnosis codes (Massachusetts General Brigham) or a combination of the diagnosis codes, laboratory results, and HIV clinic visits (Parkland Health).[13] We identified all subsequent cytology and HPV tests, procedures, and cancer diagnoses within 30 months of high-grade dysplasia treatment; cancer diagnoses were identified from pathology and central cancer registries. *Abnormal test results* were defined as atypical squamous cells of undetermined significance cytology or worse, regardless of HPV status, or positive HPV status, regardless of cytology or HPV genotype. Analyses were conducted with SAS 9.4.

RESULTS

A total of 3,880 patients with no history of hysterectomy or cervical cancer received a high-grade dysplasia diagnosis while in the cohort, mostly from diagnostic colposcopic biopsies or ECC (Table 1). Among patients with these diagnoses, 3,146 received treatment within 12 months of diagnosis and were eligible for analysis. Across systems, most patients who completed treatment for high-grade dysplasia were aged 30–39 years (overall 60.2%, Massachusetts General Brigham 58.9%, Parkland Health 60.9%), had no or few known comorbidities (overall 84.1%,

Table 1. Demographic Characteristics of Members of the Population-based Research to Optimize the Screening Process Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations sites Cohort Under Surveillance After Treatment for High-Grade Dysplasia, by Health Care System

	Total	MGB	PH
System			
Total high-grade dysplasia diagnoses	3,880	1,268	2,612
High-grade dysplasia on colposcopic biopsy or ECC	3,448	1,053	2,395
Eligible because of high-grade dysplasia on colposcopic biopsy or ECC with treatment within 12 mo*	2,714 (78.7)	830 (78.7)	1,884 (78.7)
Eligible because of high-grade dysplasia on diagnostic LEEP	432	215	217
Total patients eligible for analysis	3,146	1,045	2,101
Patient characteristics†			
Age at high-grade dysplasia treatment (y)			
30–39	1,895 (60.2)	615 (58.9)	1,280 (60.9)
40–49	828 (26.3)	254 (24.3)	574 (27.3)
50–59	334 (10.6)	132 (12.6)	202 (9.6)
60–65	89 (2.8)	44 (4.2)	45 (2.1)
Race and ethnicity‡			
Black, non-Hispanic	541 (17.2)	99 (9.5)	442 (21.0)
Hispanic	1,673 (53.2)	228 (21.8)	1,445 (68.8)
White, non-Hispanic	763 (24.3)	592 (56.7)	171 (8.1)
None of the above, multiple races, unknown	169 (5.4)	126 (12.1)	43 (2.0)
Insurance§			
Commercial	617 (25.8)	580 (64.4)	37 (2.5)
Medicare	799 (33.5)	295 (32.7)	504 (33.9)
Medicaid, other, uninsured	972 (40.7)	26 (2.9)	946 (63.6)
Unknown	758	144	614
Comorbidity score‖			
0–1	1,982 (84.1)	648 (81.2)	1,334 (85.6)
2 or higher	374 (15.9)	150 (18.8)	224 (14.4)
Unknown	790	247	543
BMI (kg/m^2)¶			
Lower than 18.5	29 (1.3)	16 (1.9)	13 (0.9)
18.5–24.9	674 (30.0)	385 (46.1)	289 (20.5)
25.0–29.9	748 (33.3)	248 (29.7)	500 (35.5)
30.0 or higher	793 (35.3)	187 (22.4)	606 (43.0)
Unknown	902	209	693
Yost quintile (state)#			
1—lowest socioeconomic status quintile	1,139 (38.2)	262 (26.2)	877 (44.3)
2	674 (22.6)	120 (12.0)	554 (28)
3	396 (13.3)	123 (12.3)	273 (13.8)
4	372 (12.5)	164 (16.4)	208 (10.5)
5—highest socioeconomic status quintile	400 (13.4)	331 (33.1)	69 (3.5)
Unknown	165	45	120
HIV diagnosis before high-grade dysplasia treatment			
Yes	114 (3.6)	11 (1.1)	103 (4.9)
No	3,032 (96.4)	1,034 (99.0)	1,998 (95.1)

(*continued*)

Table 1. Demographic Characteristics of Members of the Population-based Research to Optimize the Screening Process Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations sites Cohort Under Surveillance After Treatment for High-Grade Dysplasia, by Health Care System (*continued*)

	Total	MGB	PH
Time from high-grade dysplasia to treatment (mo)**			
1 or less	837 (26.6)	510 (48.8)	327 (15.6)
More than 1 to 3 or less	1,625 (51.7)	452 (43.3)	1,173 (55.8)
More than 3 to 6 or less	523 (16.6)	63 (6.0)	460 (21.9)
More than 6 to 12	161 (5.1)	20 (1.9)	141 (6.7)

MGB, Massachusetts General Brigham; PH, Parkland Health; ECC, endocervical curettage; LEEP, loop electrosurgical excision procedure; BMI, body mass index.

Data are n or n (column %).

* Patients with high-grade dysplasia on colposcopic biopsy or ECC were eligible for analysis if a non–hysterectomy treatment procedure was completed within 12 months and if the treatment procedure did not yield a cancer diagnosis. Patients were excluded because of not completing a treatment procedure (14.2% [14.4–14.5% across sites]), not completing a treatment procedure within 12 months of the high-grade dysplasia on colposcopic biopsy or ECC (2.6% [1.3–3.2% across sites]), receiving a hysterectomy as the next procedure after high-grade dysplasia on colposcopic biopsy or ECC (0.9% [0.8–0.9% across sites]), or being diagnosed with cervical cancer at the treatment procedure (1.3% [1.2–1.4% across sites]).

† Percentages (column %) exclude missing data counts from the denominator for each patient characteristic.

‡ Race and ethnicity were sequentially assigned at cohort entry with the following mutually exclusive categories: Hispanic, regardless of race; Black, non-Hispanic; White, non-Hispanic; other (non-Hispanic), which included cohort members who identified as Asian, Native Hawaiian, Pacific Islander, Native American, Alaska Native, or other, as well as cohort members who identified with multiple races described above; and unknown, which included cohort members without a documented ethnicity or race.

§ Ascertained from all visits that occurred during the calendar year preceding high-grade dysplasia treatment. If multiple insurance designations were observed within a calendar year, a single insurance designation was assigned in decreasing priority as follows: Medicaid, other, uninsured, which included other government payers, other insurance, medical assistance, and uninsured; Medicare; and commercial.

‖ Ascertained from all diagnoses documented in the health care system during the calendar years preceding high-grade dysplasia treatment. Comorbidity score was calculated according to weights presented in Quan et al.[18]

¶ Ascertained at the latest visit that occurred during the calendar year preceding high-grade dysplasia treatment. Most (MGB, n=136, 65.1%; PH, n=538, 77.6%) weight measurements were missing because the high-grade dysplasia diagnosis treatment occurred during the calendar year in which the person entered the cohort, so no weight evaluation in the preceding year was available.

Composite score was ascertained from the Census tract in which the cohort member resided at METRICS (Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations sites) cohort entry and is presented relative to all Census tracts within the respective state of residency. Residential Census tract may not have been ascertained during the calendar year in which high-grade dysplasia treatment occurred.

** Treatment procedures for high-grade dysplasia were almost exclusively LEEPs (n=1,780 [56.6%]) or cones (n=1,337 [42.5%]); few patients were treated with cryotherapy or laser (n=15 [0.5%]).

Massachusetts General Brigham 81.2%, Parkland Health 85.6%), and received treatment within 3 months of HSIL diagnosis (overall 78.3%, Massachusetts General Brigham 92.1%, Parkland Health 71.4%). The distribution of race and ethnicity, insurance status, and socioeconomic status as reported by the Yost Quintile varied by system as previously described.[12] Patients from Massachusetts General Brigham were largely non-Hispanic White (57.0%), commercially insured (64.4%), and in the two highest socioeconomic quintiles (49.5%). In contrast, patients from Parkland Health were predominantly Hispanic (68.9%), had Medicaid insurance or other government payers or were uninsured (63.6%), and were in the lowest socioeconomic quintile (44.3%).

Approximately half of patients completed two surveillance co-tests within 30 months of treatment for high-grade dysplasia (overall 45.5%, Massachusetts General Brigham 55.3%, Parkland Health 40.6%; Table 2). Among those patients who completed two surveillance co-tests, 31.3% (Massachusetts General Brigham 30.9%, Parkland Health 31.6%) received at least one abnormal result, and two-thirds received two negative results (overall 68.7%, Massachusetts General Brigham 69.2%, Parkland Health 68.4%). Patients who completed two co-tests tended to be in the cohort longer than those who did not (median overall 64.3 months vs 39.7 months, median Massachusetts General Brigham 64.9 months vs 33.1 months, Parkland Health 63.9 months vs 41.8 months). In addition, the timing of co-testing occurred within or at approximately 12-month intervals (dysplasia treatment to first co-test: median overall 7.5 months, Massachusetts General Brigham 6.4 months, Parkland Health 10.1 months; first to second co-test: median overall 12.0 months, Massachusetts General Brigham 8.5 months, Parkland Health 12.0 months).

Table 2. Surveillance Completion After Treatment for High-Grade Dysplasia, by Health Care System

Surveillance Within 30 mo of Treatment for High-Grade Dysplasia	Total	MGB	PH
Total patients*,†	3,139	1,044	2,095
Completed 2 co-tests‡	1,428 (45.5)	577 (55.3)	851 (40.6)
All negative co-test results	982 (68.7)	399 (69.2)	582 (68.4)
1 or more abnormal co-test results§	447 (31.3)	178 (30.9)	269 (31.6)
Did not complete 2 co-tests‖,¶,#	1,711 (54.5)	467 (44.7)	1,244 (59.4)

MGB, Massachusetts General Brigham; PH, Parkland Health.
Data are n or n (column %).
* Overall, n=16 (0.5%) patients were diagnosed with cervical cancer after treatment for high-grade dysplasia; the median (interquartile range, range) time from treatment to cancer diagnosis was 14.9 (3.8–45.9, 1.1–77.2) months. Surveillance completion estimates excluded seven patients (0.2%) diagnosed with cancer within 6 months of treatment for high-grade dysplasia and before surveillance co-testing initiation.
† The median (interquartile range, range) time after treatment for high-grade dysplasia to cohort exit in the overall cohort was 50.1 (32.2–77.5, 0.0–131.8) months (MGB, 49.4 [29.4–78.5, 0.1–130.6] months; and PH, 50.4 [34.2–77.1, 0.0–131.8] months).
‡ The median (interquartile range, range) time after treatment for high-grade dysplasia to cohort exit was 64.3 (46.7–92.2, 9.0–131.8) months (MGB, 64.9 [44.4–94.6, 12.2–130.6] months; and PH, 63.9 [47.9–90.1, 9.0–131.8] months). The median (interquartile range, range) months between treatment for high-grade dysplasia and first co-test was 7.5 (6.0–12.1, 1.0–26.7) months (MGB, 6.4 [5.1–9.2, 2.0–22.8] months; and PH, 10.1 [6.6–12.6, 1.0–26.7] months). The median (interquartile range, range) months between first co-test and second co-test was 12.0 (6.4–13.1, 0.2–24.7) months (MGB, 8.5 [6.0–12.6, 1.8–24.7] months; and PH, 12.0 [8.0–13.5, 0.2–23.9] months).
§ Abnormal results among patients who completed two co-tests within 30 months of treatment for high-grade dysplasia were predominantly low-grade results (atypical squamous cells of undetermined significance or low-grade squamous intraepithelial lesion; n=332, 74.3%), then high-grade results (high-grade squamous intraepithelial lesions, atypical glandular cells, or atypical glandular cells; n=83, 18.6%), and HPV-positive (non–16/18-positive; n=32, 7.2%). Few patients who completed two co-tests within 30 months were diagnosed with cancer more than 30 months after treatment for high-grade dysplasia (n≤5, 0.2%); the median (interquartile range, range) time from HSIL treatment to cancer diagnosis was 44.5 (34.1–47.4, 34.1–47.4) months.
‖ The median (interquartile range, range) months after treatment for high-grade dysplasia to cohort exit was 39.7 (21.6–60.0, 0–130.2) months (MGB, 33.1 [17.0–54.5, 0.1–127.7] months; and PH, 41.8 [23.9–62.5, 0.0–130.2] months).
¶ Few patients who did not complete two co-tests within 30 months were diagnosed with cervical cancer more than 9 months after treatment for high-grade dysplasia (n=7, 0.4%); the median (interquartile range, range) time from high-grade squamous intraepithelial lesions treatment to cancer diagnosis was 44.2 (12.8–76.7, 4.4–77.2) months.
# Among patients who did not complete two co-tests within 30 months, 214 (12.5%; MGB, n=29 [6.2%] and PH, n=185 [14.9%]) had a trachelectomy or full, total, or radical hysterectomy.

Few patients were diagnosed with cervical cancer within 30 months of treatment for high-grade dysplasia (n=16, 0.5%). Approximately half (n=7, 0.2% of total) were diagnosed within 6 months of treatment for high-grade dysplasia and before initiation of surveillance co-testing. Among those patients who completed two surveillance co-tests within 30 months of HSIL treatment, 0.2% (n≤5) were diagnosed with cervical cancer in the ensuing study follow-up time. A greater percentage of patients (0.4% [n=7]) who did not complete guideline-concordant surveillance after HSIL treatment were diagnosed with cervical cancer, although further analyses are limited by the small number of events and short follow-up time frame.

DISCUSSION

The proportion of patients who completed guideline-concordant surveillance after treatment for high-grade dysplasia among two large health care systems in the United States from 2010 to 2019 was low (45.5%). Furthermore, approximately one-third of patients who completed two co-tests had an abnormal co-test result after dysplasia treatment, indicating an elevated risk of continued dysplasia among these patients. Approximately half of cancer cases were diagnosed within 6 months of excisional procedure, which may indicate incomplete treatment of high-risk dysplasia. Consistent with prior literature,[2–4] these findings demonstrate that patients who have completed treatment for high-grade dysplasia remain at higher risk of cervical abnormality than their counterparts and thus should not return to routine cervical cancer screening. Prior data have shown a decrease in rates of CIN 3 or worse after three negative co-tests,[7] with overall 3- to 5-year CIN 3 or worse risk estimated at 0.44% compared with 0.91%. The updated 2019 ASCCP guidelines proposed a risk-based algorithm for treatment of cervical dysplasia and updated recommendations to three co-tests after HSIL treatment. Although the sites served different patient populations (more Hispanic or Latine and Black populations and uninsured or publicly insured patients at Parkland Health compared with Massachusetts General Brigham) and geographic catchment areas, they demonstrated similar trends, a low completion of even two surveillance co-tests, making compliance with the newly recommended

three tests even more unlikely. Future studies should continue to monitor timely care delivery to determine whether disparities are arising in this select group of patients with an ongoing higher risk of cancer and precancer.

This is a large study of a U.S.-based cohort following surveillance completion after treatment for high-grade cervical dysplasia. Because of the health care systems included in the PROSPR METRICS Consortium, this population represents a more diverse selection of patients than prior studies. Variations between sites were likely attributable to a variety of factors, including state-level policies affecting public insurance accessibility and patient geographic movement, which may take them out of the health care system. More than 75% of the patient cohort identified as non-White (Hispanic, Black, or other) and had noncommercial insurance (eg, Medicare, Medicaid, National Breast and Cervical Cancer Early Detection Program). Although these government programs minimize out-of-pocket costs for the diagnostic procedures and surveillance tests, they do not reimburse for social needs (eg, parking, child care) that may hamper completion of follow-up care. The high proportion of abnormal results after dysplasia treatment indicates that this population at high risk requires outreach to support frequent and deliberate surveillance. A study strength is that we had specific pathology data, including diagnoses, as well as subsequent cytology and HPV results. A prior study by Perkins et al[8] found that only half of women with an abnormal result recommended for 1-year repeat testing received such testing. Because the present study focused on a population who underwent treatment for high-grade histopathologic dysplasia, the increase in follow-up rates compared with prior studies may reflect a patient population with increased understanding and awareness of to the importance of surveillance. Efforts to educate patients on the benefits of cervical cancer screening have demonstrated increased screening uptake[14] and diagnostic colposcopy,[15,16] but no targeted interventions for patients already diagnosed with cervical dysplasia have demonstrated increased treatment or surveillance adherence. Prior studies examining follow-up after treatment of high-grade dysplasia demonstrated similar findings of a persistent, prolonged risk of cervical cancer.[6] Soutter et al[6] postulate that one major source of these elevated rates is a lack of detected posttreatment dysplasia.

Because this is a retrospective cohort study, no definitive conclusions can be made as to why the completion of guideline-concordant surveillance was suboptimal, and we were unable to capture follow-up testing conducted outside of the health care systems. In addition, no data on margin status of the excisional procedures were collected. Patients with positive margins would have needed an earlier first co-test and three total within the first 2 years of surveillance. In addition, the short follow-up time period of this cohort makes it difficult to determine these patients' lifetime rate of cervical cancer. Although the present health care systems have distinct underlying patient populations and practices, neither system achieved compliance with surveillance guidelines. The collected data also cannot account for patients who left their original health care system during this surveillance period because of change in their employer-based insurance coverage, a common factor in the United States driving discontinuity in care. Prior studies have shown that lack of insurance and lack of patient awareness are major contributors to lack of timely cervical cancer screening.[17] In this population of patients who have already undergone treatment for high-grade dysplasia, multifactorial causes, including clinician education, patient awareness, and loss of continuity within a single health care system, are all equally important to consider. Targeted quality improvement initiatives both within health care systems and in patient communities would improve guideline-adherent surveillance.

This study highlights a vulnerable population at high risk of recurrent cervical dysplasia. As expected, this cohort had a persistently elevated risk of abnormal cytology and HPV co-test results after high-grade dysplasia treatment. Despite this risk, guideline-concordant surveillance for this population is low, and the proportion of subsequent abnormal test results remained elevated compared with the general screening population. Further studies need to be completed to identify the barriers to maintaining surveillance, and subsequent interventions should focus on this population at high risk.

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