



Short communication

Patient, provider, and clinic factors associated with the use of cervical cancer screening

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ABSTRACT

Cervical cancer screening delivery remains suboptimal. Understanding the multiple influences on use of screening is important to designing interventions. We describe the influence of patient, primary care provider (PCP), and clinic characteristics on whether a woman is up-to-date with cervical screening as of December 2016. PCPs ($n = 194$) and their female screen-eligible patients age 21–65 years ($n = 32,115$) were included in this cross-sectional analysis of patients from two primary care networks linked to a contemporaneous PCP survey. Principal independent variables for patients included: age, race, insurance, continuity of care; for PCP included: overall satisfaction with the practice of medicine, gender, hours worked per week, financial support for achieving clinical targets; and for clinic included: routine receipt of data on preventive care performance and language translation resources. Overall, 66.6% of women were up-to-date. Women were less likely to be up-to-date with cervical cancer screening if they were younger and were more likely to be screened if they were Black, Hispanic or Asian vs. White. Women with greater continuity of primary care or with a female PCP were more likely to be up-to-date (1.52; 1.33–1.75); those who received care in a clinic that was less prepared to manage language translation were less likely to be up-to-date (0.78; 0.65–0.95). Patient, provider, and clinic factors all influence use of cervical cancer screening. Systems interventions like improving continuity of care, promoting translation services, or enhanced efforts to track screening among patients of male PCPs may improve delivery.

1. Background

While cervical cancer incidence and mortality has declined dramatically with the introduction of routine screening, these rates have stagnated over the past 10 years in part because many women are not up-to-date with screening (Smith et al., 2019; Screening, 2020). Conceptual models suggest that variation in use of cancer screening occurs at multiple levels including patient, provider, and clinic (Zapka et al., 2003; Beaber et al., 2015). Yet, most literature on screening variation has focused on patient characteristics, and has found greater use among women who are Black vs. White, White vs. Asian, Hispanic, insured (vs. uninsured), or of higher (vs. lower) socioeconomic status (Sabatino et al., 2021; Watson et al., 2017; Screening et al., 2020).

Data are limited regarding how characteristics or beliefs of primary

care providers (PCP,) or the clinics where they practice, may influence the care delivered to their patients. Several studies suggest that patients of female providers are more likely to receive cervical cancer screening (Kreuter et al., 1995; Lurie et al., 1993; Leinonen et al., 2017). PCPs commonly experience poor job satisfaction, but there is limited information about the relationship between provider satisfaction and the quality of care they deliver (Linzer et al., 2009; Linzer, 2018). At the clinic level, population management with navigation may improve delivery of cancer screening, particularly for disadvantaged patients (Percac-Lima et al., 2016). For patients with limited English proficiency (LEP), provision of translation may improve cancer screening rates (Genoff et al., 2016). However, few studies have empirically measured the simultaneous influences of multi-level factors at higher levels (provider, clinic) with up-to-date screening (Kreuter et al., 1995; Lurie et al.,

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1993; Leinonen et al., 2017). Our goal was to extend what is known about the relationship between provider and clinic characteristics, including PCP work satisfaction, use of financial incentives to achieve clinical targets, use of audit and feedback of preventive service targets and availability of translation services, independent of patient characteristics, and the use of cervical cancer screening. Expanding empirical evidence about the multi-level influences on cancer screening use is critical to the design and implementation of screening promotion interventions.

2. Methods

2.1. Overview

This study was conducted as part of the NCI-funded Population-based Research Optimizing Screening through Personalized Regimens (PROSPR) consortium (Beaber et al., 2015). An overall aim of PROSPR is to understand how multi-level factors influence the cancer screening processes.

In December 2015, Mass General Brigham Health conducted a survey of its affiliated PCPs modeled on the 2015 Commonwealth Fund International Survey of Primary Care Physicians (<https://www.commonwealthfund.org/publications/surveys/2015/dec/2015-com-monwealth-fund-international-survey-primary-care-physicians>) to ascertain clinic supports and barriers to providing high quality and efficient medical care (response rate 60%). Two of the Mass General Brigham-affiliated primary care networks, Massachusetts General Hospital (MGH) and Brigham and Women's Hospital (BWH), are affiliated with the PROSPR cervical cancer research center, METRICS (Multi-level Optimization of the Cervical Cancer Screening Process in Diverse Settings & Populations), which extracts detailed utilization data on cervical screening and diagnostic services received by female patients receiving primary care in the health systems.

This cross-sectional analysis linked the provider survey data to screening utilization data in the METRICS central data repository for 2016, to ensure that cervical screening practices observed were reflective of the characteristics reported in the survey. The Mass General Brigham Health Institutional Review Board approved collection of the METRICS data from existing clinical and administrative data and the linkage of the METRICS data to the provider survey conducted in 2015 by the Partners Center for Population Health Evaluation and Research Unit.

2.2. Study population

The METRICS data repository compiles longitudinal cohort data on women who visited a MGH or BWH-affiliated primary care clinic. Because this analysis is focused on screening, we limited the analytic cohort to average-risk women ages 21–65, and excluded women with a prior hysterectomy, history of cervical cancer or cervical screening abnormality, and/or were HIV-positive. Attending-level PCPs who practiced at one of the primary care networks in December 2015 were included if they responded to the survey and had at least 5 patients included in the METRICS cohort.

2.3. Data and covariates

Patient characteristics obtained from METRICS repository included: age, race/ethnicity, health insurance, and the number of unique primary care providers seen during the cohort period as a measure of continuity of care. Continuity is one of the central characteristics of primary care that can influence the use of preventive care (Starfield et al., 2005).

Provider characteristics obtained from the provider survey included: age, gender, number of hours worked per week, overall satisfaction with practicing medicine, whether they personally received financial incentives for achieving clinical care targets.

Clinic characteristics obtained from the provider survey included: whether the clinic routinely reviews data on the percent of patients who receive preventive care, and how prepared their clinic is to manage care for patients who need language translation. We also controlled for primary care network.

2.4. Outcome variable

We examined whether a woman was up-to-date with screening as of December 2016 defined as having a Pap test in the prior 3 years or having a co-test in the prior 5 years for those age 30–65 years, reflecting screening guidelines (Moyer, 2012).

3. Statistical analyses

Descriptive statistics were used to summarize the relationship between patient, provider and clinic characteristics and the binary outcome of up-to-date with screening. Multivariable logistic regression using population-averaged generalized estimating equations was employed to account for correlation among patients care for by the same PCP and to simultaneously examine patient, provider and clinic-level characteristics. Based on literature and prior knowledge, the multivariable model included these provider and clinic characteristics *a priori*: gender, hospital network, hours worked per week, overall satisfaction, receipt of financial incentives for achieving clinical targets, routine receipt of data on preventive care performance, and clinic preparedness for language translation. Patient characteristics included age, race/ethnicity, insurance status, and number of providers seen. All analyses used SAS software V.9.4 (SAS Institute, Cary, North Carolina, USA).

4. Results

4.1. Description of the patients, primary care providers and clinics

Of the 74,965 women in the METRICS data repository meeting eligibility criteria for this study, 32,115 (42.8%) were linked to a PCP who had completed a survey ($n = 194$, 71.3% of PCPs who completed the survey).

Median age of patients in our sample was 50 years (Table 1). Most (73.6%) were non-Hispanic White, with 9.7% Hispanic, 7.7% non-Hispanic black, and 6.2% Asian. The majority (79.4%) had commercial insurance, 16.5% were covered by Medicaid or another public program, and small numbers of women had Medicare (2.0%), dual coverage (1.6%) or were uninsured (0.1%). Most women, 21,397 (66.6%), were up-to-date with their cervical cancer screening. One-third of the PCPs were younger than 44 years and one-third were older than 55 years. Most providers were female (64.4%) and reported being very or somewhat satisfied with practicing medicine (64.9%). Most PCPs reported working in a clinic that routinely receives and reviews data on percent of patients receiving recommended preventive care (82.0%) and is somewhat or well-prepared to care for patients needing language translation (83.2%).

4.2. Multi-level factors associated with screening use

The relationship between patient, provider and clinic characteristics and patients being up-to-date with cervical cancer screening is shown in Table 2. In the multivariable model, patients were less likely to be up-to-date with cervical cancer screening if they were 21–29 years of age vs. older (odds ratio 0.67; 95% confidence interval 0.60, 0.74), and were more likely to be screened if they were Hispanic, Black or Asian women compared to White women. Patients with Medicare or multiple insurances were less likely to be up-to-date compared to patients who had commercial insurance. Women with greater continuity of primary care, who saw 1 PCP during the study period, were more likely to be up-to-date than those who saw 3 or more PCPs (0.80; 0.72, 0.89).

Table 1
Patient and Provider Characteristics.

	Patient Characteristics
N	32,115
Age of Patient (Median [IQR])	50 years [42,58]
Race (N, %)	
White	23,646 (73.6)
Black	2478 (7.7)
Asian/Pacific Islander	1992 (6.2)
Other/Unknown	880 (2.7)
Hispanic	3119 (9.7)
Insurance (N, %)	
Medicare	634 (2.0)
Medicaid	5307 (16.5)
Commercial Insurance	25,508 (79.4)
Uninsured	24 (0.1)
Multiple Insurance	498 (1.6)
Unknown	144 (0.4)
Number of unique providers seen (N, %)	
1	23,216 (72.3)
2	6492 (20.2)
3+	2407 (7.5)
	Provider Characteristics
N	194
Age of Provider (years)	
<44	65 (33.5)
45–54	60 (30.9)
55+	69 (35.6)
Gender	
Female	125 (64.4)
Hours worked per week	
≤30	64 (33.0)
31–49	55 (28.4)
≥50	75 (38.7)
Visit length	
≥20 min	123 (63.4)
Overall satisfaction with practicing medicine	
Very satisfied	39 (20.1)
Satisfied	87 (44.8)
Somewhat dissatisfied	57 (29.4)
Very dissatisfied	11 (5.7)
Personally receive extra financial incentives to achieve clinical care targets	
Yes	139 (71.6)
No	27 (13.9)
Not sure	28 (14.4)
Clinic routinely reviews data on whether patients have received recommended preventive care (Smith et al., 2019)	
Yes	155 (82.0)
How prepared clinic is to manage care for patients needing language translation (Screening, 2020)	
Well-prepared	74 (38.7)
Somewhat prepared	85 (44.5)
Not prepared	32 (16.8)

Note: ¹ Missing responses for n = 5; ² Missing responses for n = 3

Patients cared for by female providers were more likely to be up-to-date (1.52; 1.33, 1.75). There was no association between number of hours worked per week, overall professional satisfaction, or whether a provider reported having personally received a financial incentive for clinical care targets and the use of cervical cancer screening. Patients cared for by providers who reported that their clinic was not prepared or only somewhat prepared for language translation were less likely to be up-to-date with cervical cancer screening than those who reported that their clinic was well prepared (0.78; 0.65, 0.95). In a secondary analysis, we found that clinics that were more prepared for language translation were those that were more likely to care for Hispanic patients (well prepared for translation of 25.3%, 27.6% and 72.9%, respectively for clinics with a population < 4% Hispanic women, 4–8.9%, and at least 9%).

Table 2
Multi-Level Factors Associated with Up-to-Date Cervical Cancer Screening.

	Up-to-Date with Screening		
	%	Odds Ratio (95% Confidence Interval)	p
All	66.6%		
Patient characteristics			
Age (years)			
21–29	59.7%	0.67 (0.60, 0.74)	<0.0001
30–65	67.0%	REF	
Race			
White	64.4%	REF	
Black	72.2%	1.46 (1.32, 1.62)	<0.0001
Hispanic	77.6%	1.90 (1.66, 2.17)	<0.0001
Asian/Pacific Islander	69.8%	1.22 (1.10, 1.36)	0.0002
Other/Unknown	65.2%	1.10 (0.93, 1.30)	0.27
Insurance			
Medicare	59.0%	0.65 (0.55, 0.76)	<0.0001
Medicaid	70.1%	1.01 (0.92, 1.09)	0.89
Commercial Insurance	66.2%	REF	
Uninsured	50.0%	0.63 (0.25, 1.60)	0.33
Multiple Insurance	59.2%	0.68 (0.56, 0.82)	<0.0001
Unknown	66.7%	0.99 (0.53, 1.85)	0.98
Number of unique providers seen			
1	67.0%	REF	
2	66.5%	0.94 (0.84, 1.05)	0.29
3+	63.1%	0.80 (0.72, 0.89)	<0.0001
Provider characteristics			
Gender			
Male	58.7%	REF	
Female	68.8%	1.52 (1.33, 1.75)	<0.0001
Hours worked per week			
≤30	67.1%	1.00 (0.87, 1.16)	0.99
31–49	68.6%	1.10 (0.95, 1.28)	0.19
≥50	64.9%	REF	
Overall satisfaction with practicing medicine			
Satisfied	66.9%	REF	
Dissatisfied	66.0%	0.94 (0.81, 1.09)	0.41
Personally receive extra financial incentives to achieve clinical care targets			
Yes	67.4%	REF	
No	59.6%	0.84 (0.66, 1.06)	0.14
Not sure	66.8%	0.96 (0.81, 1.13)	0.60
Clinic Characteristics			
Clinic routinely reviews data on whether patients have received recommended preventive care*			
Yes	66.4%	REF	
No	67.6%	1.06 (0.91, 1.23)	0.48
How prepared clinic is to manage care for patients needing language translation*			
Well-prepared	70.1%	REF	
Somewhat prepared	66.3%	0.89 (0.78, 1.02)	0.093
Not prepared	61.4%	0.78 (0.65, 0.95)	0.013

Note: *Missing data includes: Clinic routinely review data (N = 1058), Clinic language translation preparedness (N = 339)

5. Discussion

Understanding patient, provider, and clinic influences on the use of health care is critical to ensuring delivery of evidence-based care (Zapka et al., 2003; Onega et al., 2014). This paper extends the evidence about multi-level influences on cervical screening by linking PCP survey data to contemporaneous cervical cancer utilization data of their patients. Our work supports prior findings demonstrating that younger patients are less likely to be screened than older women and that Black women are more likely to be screened than White women, but contrary to prior work, shows that Hispanic and Asian women were more likely in this sample to be screened than White women (Sabatino et al., 2021; Watson

et al., 2017; Screening et al., 2020). We also found that patients of female PCPs were more likely to be up-to-date with cervical cancer screening than those of male PCPs. A cross-sectional analysis using Medical Expenditure Panel Survey (MEPS) data from 2003 to 2010, showed that gender concordance significantly associated with higher proportion of up-to-date cervical and breast cancer screening (Malhotra et al., 2017). Cervical cancer screening was not associated with provider satisfaction with the practice of medicine, number of hours worked per week, or provider report of receipt of financial incentive to achieve clinical care targets. This is consistent with work life interventions to improve clinician satisfaction that have not shown improvements in the quality of care (Linzer et al., 2009, 2017).

Our paper expands what is known about multi-level patient and provider factors by also examining the influence of clinic characteristics. We found that patients cared for by providers who worked in clinics that were less prepared to do language translation were less likely to be screened. While several studies suggest that patient navigation services increase the use of cancer screening, including cervical cancer screening (Genoff et al., 2016), few studies have looked specifically at availability of language translation services to reduce other barriers to care. Providers who worked in clinics with a greater proportion of Hispanic patients were more likely to report better translation services. Possible explanations for higher screening rates of Hispanic women are PCP and clinic characteristics like the better availability of translation services or preference for female providers. We did not find evidence that feedback of whether a PCP's patients are up-to-date with preventive care, a strategy commonly used to promote screening, was associated with cervical cancer screening.

We examined patients and their PCPs from two primary care networks in the greater-Boston area; although these networks include community health centers, urban and suburban clinics, findings may not be generalizable to other health care settings. Provider knowledge and beliefs about screening practices (Haas et al., 2016), or the availability of informatics decision support were not assessed in this study (Schapira et al., 2016). The provider survey did not include a formal measure of provider burnout, but assessed overall satisfaction. We included Medicaid coverage as a proxy for socioeconomic status but no information about education. While we had information about type of insurance coverage, we do not have information about co-pays, which may be a barrier to screening. We assessed screening use based on these provider characteristics although another provider may have performed a woman's cervical cancer screening (e.g., gynecologist). It is possible that women received screening at an outside institution. Regardless of who performs a woman's Pap test, the PCP is responsible for ensuring completion. Despite these limitations, our paper has several strengths. All patients saw their provider at least once, making it possible to discuss cervical cancer screening. Because of our large sample, we could simultaneously examine the influence of patient, provider and clinic characteristics.

Patient, provider, and clinic factors all influence whether a woman is up-to-date with cervical cancer screening. Policies to improve the use of cervical cancer screening that go beyond patient outreach and education should be considered. Systems interventions like improving continuity of care, improving access to translation services or perhaps other services that promote access, or enhanced efforts to track screening among patients of male PCPs may improve screening delivery.

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CRedit authorship contribution statement

Jennifer S. Haas: Conceptualization, Funding acquisition, Investigation, Project administration, Data curation, Resources, Writing - original draft. **Christine Vogeli:** Data curation, Writing - review & editing. **Liyang Yu:** Formal analysis, Software, Writing - review & editing. **Steven J. Atlas:** Data curation, Writing - review & editing. **Celette Sugg Skinner:** Funding acquisition, Data curation, Writing - review & editing. **Kimberly A. Harris:** Data curation, Writing - review & editing. **Sarah Feldman:** Writing - review & editing. **Jasmin A. Tiro:** Funding acquisition, Data curation, Resources, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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