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ORIGINAL PAPER

A Cross-Sectional Study of Disparities in Screening Guideline Concordance Within a Student-Run Clinic

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Abstract

Examination of screening guideline concordance can help clinics and institutions identify and understand disparities within their own practices. We conducted a study to examine whether screening completion rates within a student-run free clinic (SRFC) reflected, exacerbated, or narrowed population-level disparities in outcomes by race/ethnicity and primary language. We compared completion rates for cervical cancer (n = 114), diabetic retinopathy (n = 91), colorectal cancer (n = 114), and breast cancer (n = 63) by race/ethnicity (Black, n = 37; Hispanic, n = 133; white, n = 54; other, n = 29) and primary language (English, n = 106; Spanish, n = 136; other, n = 11) among patients at Shade tree clinic (STC), an SFRC in Nashville, TN. There were no differences in screening completion rate by race/ethnicity, and Spanish-speaking patients had slightly higher rates of cervical cancer screening [91% (95% confidence interval 84–97%)] than English-speaking patients [72% (57–86%)]. Overall screening rates were comparable to national averages, and in the case of screenings performed within clinic—cervical cancer [82%; (75–89%)] and diabetic retinopathy screening [86% (79–92%)]—exceeded national averages and/or affiliated academic medical center goals. These findings extend the existing literature supporting the ability of SRFCs to provide effective care by also demonstrating one measure of equity in clinic processes, providing a framework for future studies of equity within SRFCs and traditional primary care practices.

Keywords Disparities · cancer screening · Primary care · Academic medicine · Student-run free clinic

Introduction

A growing recognition of the role of structural racism as a driver of health inequities in the United States [1] has led to a call for institutions and individual practices to examine their own clinical outcomes [2]. Rates of completion of screening services provide one metric for such examination, since guidelines written by the United States Preventive Services Task Force (USPSTF) and other bodies are typically issued on the basis of age and sex and thus allow for a comparison of clinical processes unmediated by differences in patient comorbidities.

Across the United States, Black patients are less likely to be screened for colorectal cancer than non-Hispanic white patients [3] and rates of both breast and colorectal cancer screening are lower among Hispanic Americans than other Americans [4]. Among the latter group, colorectal cancer screening rates are lower among Spanish-speaking individuals compared with English-speaking individuals [5] suggesting that language concordance with providers may be a mediator of variability in screening rates. However, whether these population-level disparities are the result of broad disparities in healthcare access within the United States or persist within individual medical practices remains largely unanswered.

Student-run free clinics (SRFCs) offer a unique opportunity to answer the call to examine intra-practice disparities, given their ability to deliver high-quality health outcomes [6, 7] and their role in offering students training in clinical practice and care attuned to health equity. Shade tree clinic (STC) is an SRFC in Nashville, Tennessee that is affiliated

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with the Vanderbilt University School of Medicine and serves as a primary medical home for approximately 300 patients without insurance. In addition to receiving a wide range of no-cost primary care, specialty medicine, medications, legal assistance, social work, and health education, patients are also able to be referred to an academic medical center for imaging and studies, including screenings and procedures, with no cost-sharing.

We compared the rates of on-time completion of screening tests by race/ethnicity and primary language among STC patients in an effort to identify potential in-practice disparities in process. As patients at STC do not have health insurance, this study setting allows for a more targeted assessment of racial and ethnic disparities outside of the context of insurance status, a potential moderator of racial health disparities [8, 9].

Methods

Patients were included in the cross-sectional analysis if they had at least two scheduled or one completed primary care visit between March 1, 2019 and March 1, 2020. We extracted patient age, sex, race and/or ethnicity (*Hispanic/Latino/a, Black Non-Hispanic, White Non-Hispanic, Other*), primary language (*English, Spanish, Other*), problem list, BMI, and A1c from the electronic medical record. We combined race and ethnicity to avoid the potential identification of patients who identify as a race/ethnicity combination shared by few patients at STC. All records were de-identified and stored within a password-protected file system. An Institutional Review Board exemption was granted for this study (IRB #210248) by the Vanderbilt University Medical Center Human Research Protections Program.

Patients' problem list and A1c were used to identify the subset of patients with diabetes mellitus who were eligible for diabetic retinopathy screening, and age and sex were used to identify the subsets of patients eligible for cervical cancer screening, colorectal cancer screening, and breast cancer screening.

The screening metrics examined in this study were selected to represent common preventive health measures that are conducted directly in the clinic setting (cervical cancer screening, diabetic retinopathy screening) and those that require a referral and an additional appointment at another location (colorectal cancer screening, breast cancer screening).

The most recent USPSTF screening guidelines were used to determine patients' completion status for cancer screening as of March 1, 2020. Patients' age as of March 1, 2020 was used to determine screening test eligibility.

For cervical cancer screening, women age 21–65, inclusive, were classified as up to date if they had a Pap smear with cytology within the last three years, or for women ages 30–65, inclusive, if they had a Pap smear with cytology paired with high-risk human papillomavirus (HPV) co-testing within the last five years [10]. Women with a prior total hysterectomy or who did not have a cervix were deemed ineligible for screening. For colorectal cancer screening, adults ages 50–75, inclusive, were classified as up to date if they had a colonoscopy within the past 10 years or a fecal immunochemical test within the past year [11]. For breast cancer screening, women ages 50–74, inclusive, were classified as up to date if they had a bilateral screening or diagnostic mammogram performed within the previous two years [12].

Because the USPSTF does not issue recommendations about the rate of diabetic retinopathy screening, the 2014 Preferred Practice Pattern from the American Academy of Ophthalmology was used to classify patients' completion status. Patients with type 2 diabetes mellitus who have had a retinal examination in the past year were classified as up to date, as were patients with type 1 diabetes who were at least five years from the date of diagnosis and who had a retinal examination within the past year [13]. Patients with type 1 diabetes mellitus who had not reached five years from their initial diagnosis were considered ineligible for screening.

After patients were subset by eligibility criteria, we reviewed individual charts to manually review and confirm completion status for these four screening tests using the electronic medical record.

Screening test completion rates were compared between eligible patients by race/ethnicity and primary language. We used 1,000 bootstrapped samples to create 95% confidence intervals for screening completion rates. We compared screening completion rates to national data from the 2018 National Health Interview Survey (NHIS) and the 2020 Vanderbilt University Medical Center (VUMC) primary care screening goals, based on 2019 national commercial payer benchmarks and VUMC rates from previous years. Statistical analyses were conducted in *R Statistical Software*, version 4.0.3 [14].

Results

A total of 253 STC patients met the initial eligibility criteria. Of these, 52% were Hispanic, 15% were non-Hispanic Black, and 21% were non-Hispanic white. Spanish was the most common primary language (54%), followed by English (42%) [Table 1].

Overall, 86% of eligible patients were up to date on screening for diabetic retinopathy, 82% for cervical cancer, 73% for colorectal cancer, and 71% for breast cancer (Table 2). There were no differences in on-time screening rates by race/ethnicity. Spanish-speaking patients [91%;

Table 1 Patient characteristics and eligibility for screening tests

	Black (N = 37)	Hispanic (N = 133)	White (N = 54)	Other (N = 29)	Overall (N = 253)
Language					
English	37 (100%)	12 (9.0%)	48 (88.9%)	9 (31.0%)	106 (41.9%)
Spanish	0 (0%)	121 (91.0%)	3 (5.6%)	12 (41.4%)	136 (53.8%)
Other	0 (0%)	0 (0%)	3 (5.6%)	8 (27.6%)	11 (4.3%)
Age					
Median [Q1, Q3]	54.0 [45.0, 59.0]	46.0 [38.0, 55.0]	55.5 [45.0, 61.0]	49.0 [40.0, 65.0]	49.0 [39.0, 59.0]
Sex					
Female	21 (56.8%)	88 (66.2%)	24 (44.4%)	12 (41.4%)	145 (57.3%)
Male	16 (43.2%)	45 (33.8%)	30 (55.6%)	17 (58.6%)	108 (42.7%)
Eligible for cervical cancer screening					
No	19 (51.4%)	60 (45.1%)	38 (70.4%)	22 (75.9%)	139 (54.9%)
Yes	18 (48.6%)	73 (54.9%)	16 (29.6%)	7 (24.1%)	114 (45.1%)
Eligible for retinopathy screening					
No	22 (59.5%)	84 (63.2%)	34 (63.0%)	22 (75.9%)	162 (64.0%)
Yes	15 (40.5%)	49 (36.8%)	20 (37.0%)	7 (24.1%)	91 (36.0%)
Eligible for colorectal cancer screening					
No	15 (40.5%)	86 (64.7%)	20 (37.0%)	18 (62.1%)	139 (54.9%)
Yes	22 (59.5%)	47 (35.3%)	34 (63.0%)	11 (37.9%)	114 (45.1%)
Eligible for breast cancer screening					
No	22 (59.5%)	105 (78.9%)	38 (70.4%)	25 (86.2%)	190 (75.1%)
Yes	15 (40.5%)	28 (21.1%)	16 (29.6%)	4 (13.8%)	63 (24.9%)

Data are reported as counts and percentages or as medians [first and third quartiles]

Table 2 Rates of completion of screening services by race/ethnicity and primary language

	Race/ethnicity				Language			Overall
	Black	Hispanic	White	Other	English	Spanish	Other	
Cervical cancer screening	72% (47%, 92%)	88% (80%, 95%)	0.81% (60%, 100%)	57% (14%, 100%)	72% (57%, 86%)	91% (84%, 97%)	0% (0%, 0%)	82% (75%, 89%)
Diabetic retinopathy screening	80% (57%, 100%)	88% (79%, 96%)	90% (76%, 100%)	71% (33%, 100%)	83% (71%, 94%)	88% (78%, 96%)	100% (100%, 100%)	86% (79%, 92%)
Colon cancer screening	86% (71%, 100%)	79% (67%, 89%)	62% (44%, 78%)	55% (23%, 88%)	70% (58%, 82%)	76% (64%, 87%)	75% (41%, 100%)	73% (65%, 81%)
Breast cancer screening	60% (33%, 86%)	86% (72%, 97%)	62% (38%, 86%)	50% (0%, 100%)	58% (41%, 76%)	82% (68% 95%)	100% (100%, 100%)	71% (60%, 83%)

Data are reported as percentages with 95% confidence intervals listed in parentheses

95% confidence interval (CI) 84–97%] were more likely than English-speaking patients (72%; 95% CI 57–86%) to be up to date on cervical cancer screening.

STC completion rates were higher than the U.S. population rates identified in the 2018 NHIS [15] and 2019 VUMC screening goals for cervical cancer screening and diabetic retinopathy screening but were not different from the national averages or VUMC goals for either colorectal or breast cancer screening (Fig. 1).

Discussion

In this study, we examined within-practice screening process measures at STC across racial/ethnic groups and across patients' primary language. Though disparities that exist along these axes are often studied at a population level, there are comparatively few studies examining intra-practice disparities in clinical care [16–18].

At STC, we found no difference in screening rates by race/ethnicity. Spanish-speaking patients were more likely

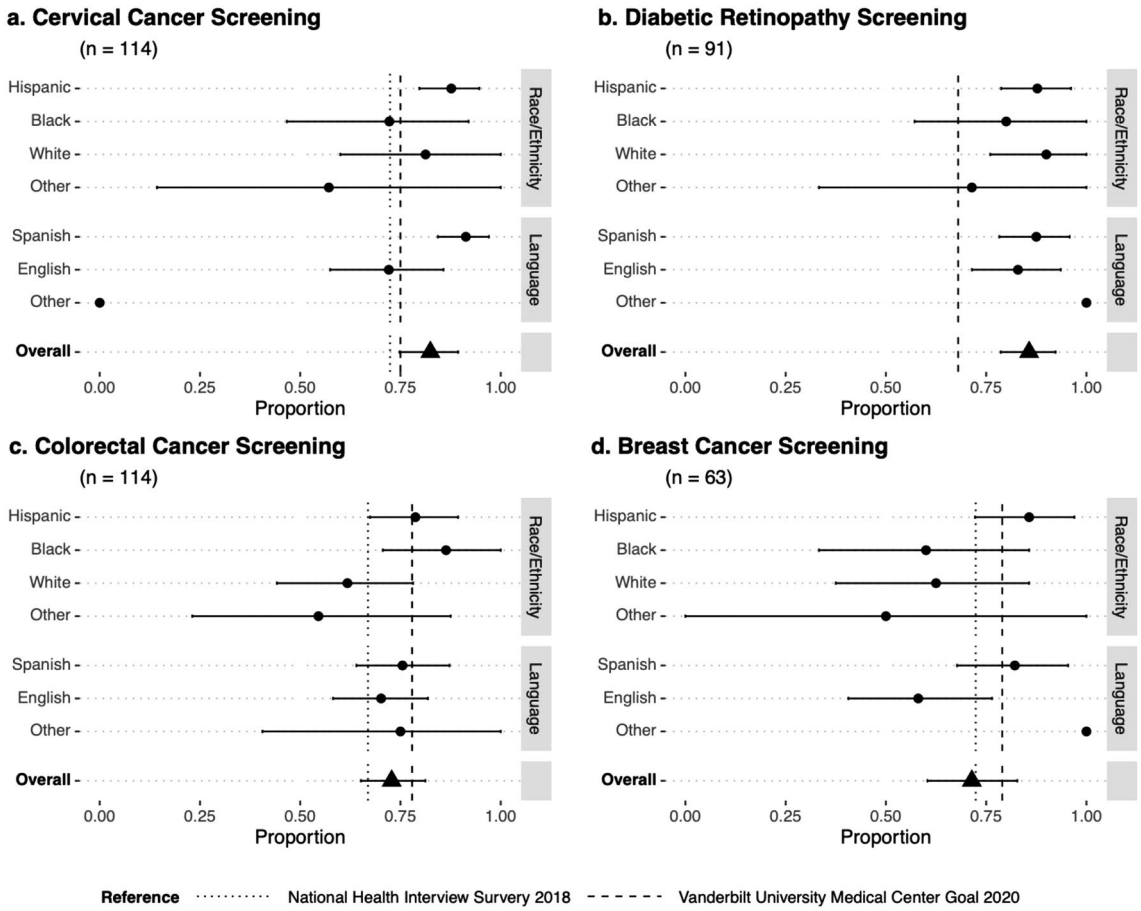

Fig. 1 Rates of screening test completion compared with U.S. population averages and affiliated medical center goals. Comparisons taken from 2018 National Health Interview Survey and 2020 Vanderbilt University Medical Center screening goals. Horizontal bars represent 95% confidence intervals

to have completed cervical cancer screening than English-speaking patients, though we did not identify other language-based disparities. Screening rates were comparable to or, in the case of cervical cancer and diabetic retinopathy screening, exceeded, U.S. population rates or academic primary care targets. The rate of diabetic retinopathy screening within the study year—86%—far exceeded previously published reports of 30–46% at SRFCs [7, 19].

Rates of screening completion in the study were influenced by patterns of scheduling within STC. Unlike other SRFCs [7] and many primary care practices, diabetic retinopathy screening at STC does not require referral to an ophthalmology practice or a separate appointment. STC is equipped with a retinal camera, and volunteers are trained to take retinal pictures and upload them to the medical record to be read by an ophthalmologist. Additionally, despite the USPSTF recommendation for biennial mammography, mammograms are often scheduled yearly at STC, with the knowledge that over 30% of appointments are not kept [20]. The influence of this scheduling pattern on rates of screening completion is outside of the scope of this current study, and future studies and quality improvement work should examine the rate of scheduled and completed mammography appointments.

Notably, completion rates for the in-clinic screening tests were much higher (82% and 86% for cervical cancer and diabetic retinopathy, respectively) than for the out-of-clinic tests (73% and 71% for colorectal cancer and breast cancer, respectively). This finding was anticipated due to the reduced burden of scheduling and transportation placed on patients when tests are conducted as part of an existing appointment. The lack of a language disparity among out-of-clinic screening tests suggests that the need to schedule additional appointments outside of clinic may not necessarily have a disproportionate negative impact on patients with limited English proficiency.

There are several limitations to this study. The overall number of patients included was small, given the relatively small size of STC and the fact that screenings are necessarily limited to a subset of the population by age,

sex, and disease status. The use of variables derived from the electronic medical record may introduce misclassification bias, given the possibility that patients' recorded race/ethnicity and primary language may not align with their self-identification. Because our approach focused on guideline concordance, some patients who require more frequent screenings due to worrisome findings on a previous screen, for instance, may be classified as up to date despite not receiving a screening recommended by their provider. Due to STC's status as an SRFC, patients receive frequent contacts from students, including appointment reminders, that may be less common in non-SRFC settings and may raise the rates of screening test completion, as frequency of patient contact has been shown to improve other outcomes in the SRFC setting [21]. Because our data were cross-sectional, there was the potential that data could be influenced by the time period selected for study and may not capture changes in screening patterns as a result of the COVID-19 pandemic, since we selected a time period immediately pre-dating the emergence of SARS-CoV-2 in the United States.

Patients at STC face no cost-sharing either within clinic or when referred for procedures and imaging at an associated academic medical center. Since as a result of the Affordable Care Act, insurers were required to cover USPSTF grade "A" and "B" recommendations with no cost-sharing for patients, and all screening tests in our study, with the exception of diabetic retinopathy screening, meet these criteria, the lack of cost-sharing faced by STC patients is unlikely to bias our results. However, our results may not be generalizable to other uninsured patients in the United States, who do not have cost-sharing protections, and for whom screening rates are much lower than the insured population. In 2015, only 47% and 54% of uninsured patients received colorectal and breast cancer screening, respectively, compared with 64% and 74% of privately insured patients [15]. Furthermore, our findings may not be fully generalizable to all patients of SRFCs, who may not have the same access to procedures performed at affiliated medical centers as STC.

This work adds to the literature on in-practice disparities in the context of racial/ethnic and language-based disparities in the United States. To our knowledge, it is the first study to compare process measures within an SRFC, as opposed to prior work comparing outcomes and process measures between an SRFC and other primary care models. Replication of this study design in non-SRFC primary care settings and continued vigilance towards the emergence of potential intra-practice disparities will prove critical to minimizing the propagation of population-level inequities in individual clinical settings.

Author contributions All authors contributed to the study conception and design. Data collection and analysis were performed by DES, PAW, and TGP. The first draft of the manuscript was written by PAW and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Data availability The data that support the findings of the current study are available from the corresponding author on request.

Code availability Statistical analyses were conducted in *R Statistical Software*, version 4.0.3.

Declarations

Conflict of interest The authors have no conflict of interest to declare that are relevant to the content of the article. Shade Tree Clinic is affiliated with Vanderbilt University School of Medicine, Vanderbilt University School of Nursing, University of Tennessee College of Pharmacy, and Vanderbilt University Medical Center. All are located in Nashville, TN. This study does not have a sponsor.

Ethical approval An Institutional Review Board exemption was granted for this retrospective chart review study (IRB #210248) by the Vanderbilt University Medical Center Human Research Protections Program.

Consent to participate Not applicable.

Consent for publication Not applicable.

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