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EVALUATING POTENTIAL RACIAL INEQUITIES IN LOW-DOSE COMPUTED TOMOGRAPHY SCREENING FOR LUNG CANCER

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Abstract

Background: Lung cancer is the leading cause of cancer death in the US. Compared with White patients, Black patients experience higher lung cancer incidence and death rates. New screening recommendations for low-dose computed tomography (LDCT) promote earlier detection of lung cancer in at-risk populations and can potentially help mitigate racial disparities in lung cancer mortality if administered equitably. Yet, little is known about the extent of racial differences in uptake of LDCT.

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Objective: To evaluate potential racial disparities in LDCT screening in a large community-based cancer center in central North Carolina.

Methods: We conducted a retrospective study of the initial patients undergoing LDCT in a community-based cancer center (n=262). We used the Pearson chi-squared test to assess potential racial disparities in LDCT screening.

Results: Study results suggest that Black patients may be less likely than White patients to receive LDCT screening when eligible ($\chi^2=51.41$, $p<.0001$).

Conclusion: Collaboration among healthcare providers, researchers, and decision makers is needed to promote LDCT equity.

Keywords

Lung Cancer Screening; Health Disparities; Primary Care; Minority Health; Health Promotion / Disease Prevention

INTRODUCTION

Lung cancer is the leading cause of cancer death in the United States, accounting for one in four cancer deaths.^{1,2} More people die from lung cancer each year than from colon, breast, and prostate cancers combined.³ Current estimates indicate that 228,150 new lung cancer cases will be diagnosed in 2019 and that 142,670 people will die from this cancer type in the same year.² When lung cancer is detected early (i.e., stages I/II), the 5-year survival rate is 56%¹. This rate falls to 18% when lung cancer is detected in advanced stages¹. Nationwide, only 16% of lung cancers are diagnosed in the early stages.¹

Significant racial disparities exist in lung cancer outcomes. Black patients, especially men, experience higher lung cancer incidence and mortality rates when compared to their White counterparts.^{2,4} For example, Black men are approximately 20% more likely to develop lung cancer than their White counterparts.³ Black patients diagnosed with lung cancer are also more likely to be diagnosed at advanced stages and report poorer quality of life.⁵⁻⁷ Furthermore, Black patients have a lower five-year relative survival rate than White patients.² Even when comparing Black and White patients of the same lung cancer stage, Black patients exhibit poorer clinical outcomes.⁵⁻⁷

Lung cancer screening using low-dose computed tomography (LDCT) reduces lung cancer-specific mortality and can potentially help mitigate lung cancer disparities if implemented equitably.⁸⁻¹¹ The U.S. Preventive Services Task Force (USPSTF) recommends LDCT annually for individuals between the ages of 55 and 80 with at least a 30-pack year history of smoking, and who are current smokers or have quit smoking within the past 15 years.^{12,13} In 2015, the Centers for Medicare and Medicaid Services (CMS) announced that it would cover LDCT for asymptomatic Medicare beneficiaries aged 55–77 with at least a 30 pack-year smoking history, who currently smoke, or have quit smoking within the past 15 years.¹⁴ CMS also requires LDCT-screened patients to be enrolled in a Lung Cancer Screening Registry (LCSR).¹⁴ However, race data are not required in the LCSR, which may preclude routine monitoring of LDCT utilization disparities at the national level.

CMS also requires that patients engage in shared decision making to discuss the benefits and risks of LDCT prior to being screened.^{14,15} The key benefit of LDCT is its potential to reduce lung cancer-specific mortality. LDCT showed a relative reduction in lung cancer-specific mortality by 20% when compared to chest radiography in the National Lung Screening Trial, a multisite randomized controlled trial (N=53,454).¹⁰ The National Lung Screening Trial team also observed a stronger effect among Black patients, highlighting LDCT's life-saving potential among diverse populations.⁸ Yet, key risks involve potential false-positives from the procedure, which can result in harm from unnecessary invasive diagnostic tests.¹⁶ As LDCT is currently the only recommended screening test for lung cancer,¹⁷ the shared decision making process is important to help eligible patients weigh LDCT's potential life-saving benefits with possible harms when deciding whether to receive this procedure or forgo screening.

Previous studies have reported widespread racial and ethnic disparities in screening for various cancer types.^{18–23} Therefore, it is important to assess potential disparities in LDCT screening utilization. A limited but growing number of studies report LDCT utilization rates or outcomes of LDCT screening programs.^{9,24,25} These studies collectively suggest low LDCT utilization among eligible populations.^{9,24,25} However, there is a paucity of evidence available about racial patterns in LDCT utilization. To address this gap in the literature, we present preliminary data on racial differences in LDCT at a large, community-based cancer center in central North Carolina.

METHODS

Using LCSR and electronic health record (EHR) data, we performed an Institutional Review Board-approved retrospective study of the initial patients undergoing LDCT at a community-based cancer center from January to June 2016. This cancer center is the primary provider of oncology services in its county and serves over 4,000 new patients diagnosed with cancer each year, with 23% of these patients identifying as Black. The cancer center covers a service area with 517,600 residents (including 299,690 White residents (57.9%) and 177,019 Black residents (34.2%)).²⁶ In collaboration with community partners, this cancer center has engaged in a concerted data-driven effort over the past decade to study and eliminate racial disparities in its health care system.

A total of 265 patients were screened during the study period. Given that only two Hispanic patients and one Native American patient were screened during this time, we restricted our cohort to the remaining 262 Black and White patients. The precise data needed to estimate the size of the cancer center's patient population eligible for LDCT were unavailable as a consequence of the strict and complex eligibility criteria. We therefore used the population of smokers, aged 55 years or older, in the cancer center's county as a proxy for LDCT-eligible individuals^{27,28}. To estimate this proxy, we calculated the number of smokers in the cancer center's county aged 55 years or older by applying North Carolina's 2011 age-specific smoking rates to the county's 2013 population of Black and White individuals age 55 years and older (Table 1).^{27,28} We used county data in our proxy estimates because US census data, which provides race-specific population information, are organized at the county-level, and the cancer center's county is the primary catchment area for this

study's LDCT screening program. Using the Pearson chi-squared test, we compared the Black-White racial composition of LDCT-screened patients to the county's Black-White racial composition of smokers aged 55 and older. The cancer center's Institutional Review Board approved this study.

RESULTS AND DISCUSSION

In our sample, 7.3% of LDCT-screened patients were Black, which contrasts with the estimated percentage of Black residents (37.1%), Black smokers (38.5%), and Black smokers aged 55 years and older (27.0%) residing in the cancer center's county (Table 1).²⁶⁻²⁸ Comparatively, 92.7% of LDCT-screened patients were White, whereas 62.9% of county residents, 61.5% of all smokers in the county, and 73% of smokers in the county aged 55 years and older were White. Compared with White patients, the proportion of LDCT-screened Black patients was significantly lower than the estimated proportion of Black individuals eligible for LDCT ($\chi^2=51.41$, $p<.0001$; Table 2).

This study provides preliminary evidence that racial disparities may exist in LDCT utilization. More specifically, results suggest that Black patients may be less likely than White patients to receive LDCT when eligible. Potential disparities in LDCT screening may exacerbate existing disparities in lung cancer mortality if Black patients are less likely to undergo screening that could identify lung cancer at earlier, more treatable stages. These results mirror findings from the limited evidence available about racial disparities in LDCT utilization. For example, an exploratory investigation found that non-Black patients were 2.8 times more likely to receive LDCT than Black patients when eligible.²⁹ Furthermore, available evidence suggests that LDCT utilization is limited in the U.S., which suggests that outreach efforts are needed to increase appropriate utilization among the general population.^{9,24,25} Our results suggest that these outreach efforts may be particularly necessary in Black populations. Future research is needed to explore whether disparities exist in other samples/settings and to identify communities where LDCT outreach efforts are particularly necessary.

These results also have implications for health systems aiming to address or pre-empt LDCT disparities among their patient populations. Indeed, these preliminary results suggest a trend (i.e., lower LDCT utilization among eligible Black patients than White patients) that may widen if healthcare organizations are not proactive in their efforts to ensure equitable LDCT administration. In particular, healthcare organizations should consider monitoring potential racial/ethnic disparities in LDCT utilization and developing plans to take action as appropriate to improve equity. For example, organizations that observe racial disparities in LDCT utilization could enhance outreach efforts to local communities to identify potential causes for disparities (e.g., limited patient knowledge about the potential benefits of LDCT and/or patient and provider concerns about LDCT costs and harms from false-positive results).³⁰ Healthcare organizations might also consider sponsoring training opportunities to expand provider capacity to engage in shared decision making with diverse patient populations about LDCT. Such trainings should support providers in efforts to clearly communicate about the costs, benefits, and harms of LDCT with patients of various sociodemographic backgrounds.³⁰

This analysis also highlights systematic barriers that most organizations would encounter when using CMS' LCSR to examine LDCT utilization disparities. For example, the LCSR does not require collection of patient race/ethnicity data, which makes it challenging to track LDCT disparities.¹⁴ Requiring race/ethnicity data in the LCSR can help organizations monitor LDCT disparities. Additionally, patient pack-year smoking history is not systematically collected in EHRs, which hinders reliable assessment of LDCT disparities among eligible patients.³¹ Healthcare organizations and providers can help mitigate this challenge by routinely documenting pack-year smoking history in EHRs.

These results must be considered in light of limitations. First, the lack of uniform data about LDCT-eligible patients resulted in the use of a proxy comparison group. Yet, the low number of Black patients screened (7%) is disproportionate when compared to the cancer center's sizable Black patient population (23%) and the percentage of Black smokers aged 55 years and older in the cancer center's county (27%). Other limitations include the lack of a patient-level sociodemographic data collection requirement in CMS' LCSR, which precluded us from exploring potential contributors to the differential screening rate by race. Finally, these results may not generalize to racial/ethnic populations excluded from this study (e.g., Hispanic/Latino and Native American populations) or other geographic areas. Additional research is needed to understand if disparities in LDCT utilization exist in other racial/ethnic groups and other underrepresented populations. Nonetheless, this paper presents preliminary data highlighting potential LDCT disparities and describes opportunities for health systems to help collect the data necessary to rigorously assess LDCT disparities.

IMPLICATIONS

This study suggests that Black patients may be less likely than White patients to receive LDCT when eligible. Collaboration among healthcare providers, researchers, and decision makers is necessary to promote LDCT equity, conduct additional research to explore potential disparities in LDCT utilization, and address the systematic barriers highlighted in this study.

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Table 1.**Racial Differences in LDCT Screening at a Community-Based Cancer Center**

	Black	White
Patients at cancer center screened with LDCT*	19 (7.3%) [†]	243 (92.7%) [†]
Smokers in the cancer center's county (age 55 and older)	4,204 (27%) [†]	11,362 (73%) [†]
Smokers in the cancer center's county (overall)	36,466 (38.5%) [†]	58,140 (61.5%) [†]
Total population in the cancer center's county	177,019 (37.1%) [†]	299,690 (62.9%) [†]

* During the study period, 265 patients were screened. Because only two Hispanic patients and one Native American patient were screened, we restricted our cohort to the remaining 262 Black and White patients. The comparison groups were also restricted to Black + White individuals only to mirror LDCT screened patients. As a result, the totals in Table 1 will not add up to county totals due to exclusion of other racial/ethnic groups.

[†] Proportions based on total population of Black and White individuals only

– County population estimates²⁶ = 517,600

– White population (62.9%) = 299,690

– Black population (37.1%) = 177,019

– Total Black and White population = 476,709 (37.1% Black, 62.9% White)

– The number of smokers in the county was calculated by applying North Carolina (NC) smoking rates by race to the county's 2015 population. In NC, 19.4% of White individuals and 20.6% of Black individuals smoke cigarettes.³²

– The number of smokers in the county who are age 55 or older was calculated by applying NC age-specific smoking rates²⁷ to corresponding population age groups in the cancer center's county.²⁸ The same age-specific smoking rates were applied to both Black and White individuals since race-specific data were missing. Also, overall smoking rates between Black and White individuals are similar.

– Smoking rates by age group: 55–64 years (18.7%), 65–74 years (12.7%) and 75–84 years (6.0%)

Note: LDCT = low-dose computed tomography

Table 2.

Test of Difference in Black and White LDCT Screening Proportions at a Community-Based Cancer Center

	Black	White	χ^2 (p-value)
<i>Comparison Group</i>			
Number of cigarette smokers age 55 and older in the cancer center's county	4204 (27%)	11362 (73%)	
<i>Study Group</i>			
Number of LDCT-screened individuals *	19 (7.3%)	243 (92.7%)	51.41 (p<.0001)

* During the study period, 265 patients were screened. Because only two Hispanic patients and one Native American patient were screened, we restricted our cohort to the remaining 262 Black and White patients. As a result, the comparison group was also restricted to Black + White individuals only to mirror LDCT screened patients.

Note: LDCT = low-dose computed tomography

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