

Racial–Ethnic Disparities in Diabetes Technology Use Among Young Adults with Type 1 Diabetes

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Abstract

Background: Recent studies highlight racial–ethnic disparities in insulin pump and continuous glucose monitor (CGM) use in people with type 1 diabetes (T1D), but drivers of disparities remain poorly understood beyond socioeconomic status (SES).

Methods: We recruited a diverse sample of young adults (YA) with T1D from six diabetes centers across the United States, enrolling equal numbers of non-Hispanic (NH) White, NH Black, and Hispanic YA. We used multivariate logistic regression to examine to what extent SES, demographics, health care factors (care setting, clinic attendance), and diabetes self-management (diabetes numeracy, self-monitoring of blood glucose, and Self-Care Inventory score) explained insulin pump and CGM use in each racial–ethnic group.

Results: We recruited 300 YA with T1D, aged 18–28 years. Fifty-two percent were publicly insured, and the mean hemoglobin A1c was 9.5%. Large racial–ethnic disparities in insulin pump and CGM use existed: 72% and 71% for NH White, 40% and 37% for Hispanic, and 18% and 28% for NH Black, respectively. After multiple adjustment, insulin pump and CGM use remained disparate: 61% and 53% for NH White, 49% and 58% for Hispanic, and 20 and 31% for NH Black, respectively.

Conclusions: Insulin pump and CGM use was the lowest in NH Black, intermediate in Hispanic, and highest in NH White YA with T1D. SES was not the sole driver of disparities nor did additional demographic, health care, or diabetes-specific factors fully explain disparities, especially between NH Black and White YA. Future work should examine how minority YA preferences, provider implicit bias, systemic racism, and mistrust of medical systems help to explain disparities in diabetes technology use.

Keywords: Young adults, Type 1 diabetes, Technology, Insulin pump, Continuous glucose monitor, Health care disparities, Inequity.

Introduction

YOUNG ADULTS (YA) OF RACIAL–ETHNIC minority are the fastest growing population with type 1 diabetes (T1D),¹ and exhibit very poor outcomes, making it critical to understand unique needs and challenges of this population. Diabetes technology therapies for T1D are proliferating and offer

better options for attaining glycemic control and preventing long-term complications. However, recent research has demonstrated that minority populations, especially YA, are among the lowest users of these new technologies,^{2–4} which may be contributing to observed disparities in glycemic outcomes.^{3,5–7} Most studies cite socioeconomic status (SES) and insurance as major drivers of low use. Nevertheless,

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Prior Presentation: This work has previously been presented at the virtual 80th Scientific Sessions of the American Diabetes Association from June 12 to 15, 2020.

several studies have noted racial–ethnic disparities in technology, regardless of insurance status or household income.^{2,4} Moreover, studies of health systems with universal coverage for these technologies demonstrate persistent racial–ethnic disparities.⁸ Taken together, these recent studies suggest that factors beyond socioeconomic position and insurance may be associated with inequities in use.

Few to no studies have examined the relative contribution of socioeconomic factors and insurance to diabetes technology use. Moreover, inclusion of factors beyond SES, such as health care factors and diabetes self-management, have largely been ignored. Given that YA are at a pivotal time in their life as they transition to increasing independence and from pediatric to adult health care, patient-reported social determinants of health and health care factors could be particularly influential in technology decisions.

We were interested in understanding the drivers of racial–ethnic disparities in insulin pump and CGM use in a diverse sample of YA with T1D. Our objectives were to: (1) measure the degree of racial–ethnic disparity in insulin pump and CGM use between NH White, NH Black, and Hispanic YA; (2) examine how multiple factors related to SES contributed to disparities; and (3) determine how patient-reported outcomes such as health care factors (care setting, clinic attendance) and diabetes self-management (diabetes numeracy, self-monitoring of blood glucose, and Self-Care Inventory [SCI] score) accounted for disparities. We hypothesized that SES and insurance status would account for the majority of the racial–ethnic disparity and that health care factors and self-management would have lesser but clinically meaningful and independent associations with disparities in use.

Methods

Study design and participants

The Young Adult Racial Disparities in Type 1 Diabetes (YARDD) study enrolled a national sample involving six T1D Exchange clinic network sites in different urban geographic regions across the United States. The study design included one-time cross-sectional data collection and was chosen to facilitate recruitment and data capture of minority YA with T1D, who are severely underrepresented in clinical research studies.⁹ Sites were selected to participate based on their ability to recruit large numbers of racial–ethnic minority groups. The sites included three pediatric centers, one adult center, and two combined pediatric–adult centers (See Supplementary Table S1 for more details). Sites enrolled participants both within and outside their existing T1D Exchange registries to promote inclusion of minority YA who may not usually participate in research and registries. We used recruitment targets to ensure equal representation of NH White, NH Black, and Hispanic participants and made efforts to recruit participants who did not show to regularly scheduled visits.

Inclusion criteria were 18–25 years of age, clinical diagnosis of T1D for at least 6 months, and English-reading ability. Participants were excluded if they were taking glucocorticoids, currently pregnant, had a developmental disability that would preclude procedural requirements of independently filling out survey measures, or were of a self-reported race–ethnicity other than the prespecified racial–ethnic groups.

Procedures

This study was approved by a central institutional review board at the Jaeb Center for Health Research. Each site individually recruited and enrolled participants with their site study staff. Written informed consent was obtained before collecting any study-specific information. After consent and enrollment, participants completed questionnaires through REDCap[®] on a tablet or computer. All language in the consent document and survey was in English and at or below a 9th grade reading level. The survey took 15–40 minutes to complete, and participants were compensated for their time. Given the sensitive and private nature of certain questions, YA participants completed the survey in a private room without other family members and could opt out of any questions. Site study staff extracted additional data from participant medical charts. The T1D Exchange acted as the coordinating center for all study-related matters. Sites were asked to maintain recruitment logs and submit them at study end; however, data were missing on 31/300 of enrolled participants (10%). Of the data collected, recruitment and enrollment ranged from 90% to 99% at the sites, and the main reason for refusal to participate was “not enough time.”

Measurements

Main measures

Race–ethnicity. Race–ethnicity was self-reported by participants and followed the classification from the U.S. Census 2000 questionnaire.¹⁰ Participants designated themselves as NH White, NH Black, or Hispanic. The majority of Hispanic participants did not categorize their race (Hispanic White or Hispanic Black), so all Hispanic categories were collapsed. This trend is in line with other studies.^{11,12} We only included NH Black and White races in this study since our a priori hypotheses were based on prior literature examining these groups. We also could not ensure sufficient recruitment of other races at the selected sites to ensure adequate representation.

Insulin pump and CGM use. Study staff extracted information from participant medical charts on current insulin pump and CGM use in the past year. CGM use was coded from medical charts spanning the year before enrollment to ensure adequate data capture since studies cite multiple CGM interruptions within a year among publicly insured populations.¹³

Potential explanatory variables

SES and insurance status

Insurance status. Study staff recorded insurance coverage of each participant, which was categorized afterward into private, public/none, and other, which included student, military, and other. There were only four participants who declared that they did not have insurance so this category was combined with the public insurance category.

Education level. Education level was asked in a question extracted from the U.S. Census asking for the highest grade or level of school completed, with multiple choice answers ranging from 8th grade or less to more than 4-year college degree.

Income. Participants were asked about their personal income level with categories of 0–\$25,000; \$25,000–50,000; \$50,000–100,000, and >\$100,000.

Hollingshead Four-Factor Index score. Participants completed the Hollingshead Four-Factor Index,¹⁴ a self-reported measure of social status based on (1) marital status, (2) employment status, (3) educational attainment, and (4) occupation, that has been shown to be a composite of individual SES influences and independently predicts health access and behaviors. The Hollingshead Index contains 15 questions with ratings on 7- to 9-point ratings for each factor. We calculated a total score using a formula for social status composed of scores for employment and education. For participants with two gainfully employed adults in the household, we used the average of the two social status scores to calculate the overall social status of the household. Hollingshead Index scores range from 8 to 66, with higher scores reflecting higher SES.¹⁴

Neighborhood poverty level. Percent poverty level in the participant's neighborhood was assessed using 9-digit zip codes and available U.S. Census data. We included neighborhood poverty as a separate variable from personal poverty level given the available literature to suggest that neighborhood poverty level can influence personal mobility and health outcomes beyond personal income.^{15,16}

Health literacy. Participants completed the Single-Item Literacy Screener,¹⁷ a one-question survey to assess health literacy in patients. Participants were asked how often they needed help reading instructions, pamphlets, or other written materials from doctors or pharmacies. Responses were on a Likert scale of never to always and were ascribed numbers from 1 to 5. Scores of 2 or less (never or rarely) signified health literacy, per scoring instructions.¹⁷

Health care factors

Clinic attendance. We used the single-item response for the clinic attendance question (“comes in for clinic visits”) from the SCI-R for a self-reported rating of clinic attendance.¹⁸ Responses were on a Likert scale ranging from “1-Never do it” to “5-Always.” Scores ranged from 1 to 5 with higher scores signifying higher self-reported clinic attendance.¹⁸

Care site. Care setting was categorized into three groups: pediatric, adult, or combined pediatric–adult diabetes centers.

Diabetes self-management

Diabetes numeracy. Participants completed the Diabetes Numeracy Test 5,¹⁹ designed to measure the numeracy skills of a patient with diabetes. It is composed of five questions that contain math problems to calculate carbohydrate counts and correctional insulin doses. Higher scores signify higher levels of numeracy. Scores were calculated by summing correct responses with a range of 1–5, with higher scores signifying more correct answers.

Self-monitoring of blood glucose. We used the single-item response from the SCI-R for a self-reported rating of blood glucose self-monitoring (“check blood glucose with monitor”). Responses were on a Likert scale ranging from “1-Never do it” to “5-Always.” Higher scores signified higher self-reported level of blood glucose monitoring. In prior studies, the SCI-R item reflecting glucose testing

frequency correlated strongly with glucose testing frequency from 24-h recall interview ($r=0.79$, $P<0.001$).¹⁸

Diabetes self-care. Participants completed the Diabetes SCI-R (SCI revised),¹⁸ as a self-report measure of diabetes self-management that contains 15 questions. Each item response uses a Likert scale ranging from “1-Never do it” to “5-Always.” Survey scores are converted to a 0- to 100-point scale for ease of interpretation. Higher total scores signify greater self-reported diabetes self-care.

Data analysis

We calculated descriptive statistics for participants overall and by race–ethnicity. We report counts (percentages) for categorical variables and mean (95% Confidence Interval, CI) or median (interquartile range, IQR) for continuous variables. We used the Pearson chi square test for univariate analyses by race–ethnicity.

For multivariate analyses, we compared current use of an insulin pump and CGM use in the past year across the racial–ethnic groups by fitting logistic regression models with the three-level race–ethnicity variable as the focal predictor. To obtain racial–ethnic group comparisons adjusted for differences in the hypothesized drivers of disparities, those variables were added to the models singly and then added to the models simultaneously. Results are presented as adjusted percentages of use in each group. Uncertainty in these estimates is shown as 95% confidence intervals (CIs). The adjusted percentages of use are calculated from the logistic regression models and show what the percentages of use in each race–ethnic group would be if each of the race–ethnic groups had the same joint distribution of the adjustment variable(s) as was observed in the entire sample. The process is similar to direct standardization commonly used for age–sex adjustment, but with more adjustment variables. Unadjusted and fully adjusted estimates are presented in Table 2. Results of analysis performing single adjustment for each individual variable is available in Supplementary Table S2.

Results

Participant characteristics

Participant characteristics are summarized in Table 1. Overall, 300 participants were recruited for the study per enrollment criteria (100 NH White, 97 NH Black, 103 Hispanic). The mean age of the sample was 20 years, 55% were female, and the mean diabetes duration was 10 years (Table 1). The mean hemoglobin A1c (HbA1c) level for NH White was 8.1% (95% CI 7.2–9.6), for NH Black was 10.5% (95% CI 9.0–12.3), and for Hispanic YA was 8.6% (95% CI 7.6–10.6).

Compared with NH White participants, both NH Black and Hispanic participants had lower individual and neighborhood SES, as demonstrated by majority Medicaid insurance, <\$50,000 annual household income, and higher percentage residence in neighborhoods below the poverty line (Table 1). Hispanic and NH Black participants had significant overlap in socioeconomic indicators (Table 1).

Racial–ethnic disparity in advanced diabetes technology use

NH White participants had significantly higher insulin pump and CGM use (insulin pump: 72%, $n=72$; CGM: 71%,

TABLE 1. PARTICIPANT CHARACTERISTICS

	Overall N=300	NH Black N=97	Hispanic N=103	NH White N=100
Diabetes technology use ^a				
Insulin pump	129 (43%)	17 (18%)	40 (39%)*	72 (72%)*
CGM	135 (45%)	27 (28%)	38 (37%)	70 (71%)*
Demographic and clinical variables				
Age (years)	20 (19–22)	21 (19–22)	20 (19–20)	21 (20–23)
Female	166 (55%)	54 (56%)	53 (51%)	59 (59%)
Diabetes duration (years)	10 (7–14)	10 (7–15)	10 (6–13)	12 (9–16)
HbA1c (%)	9.5% (7.7–11.3)	10.5% (9.0–12.3)	8.6% (7.6–10.6)	8.1% (7.2–9.6)
Socioeconomic status				
Public or no insurance	155 (52%)	55 (57%)	78 (76%)	22 (22%)
High school education or less	29 (10%)	64 (66%)	72 (70%)	24 (24%)
Annual household income <\$50,000	171 (61%)	70 (74%)	70 (74%)	31 (33%)
Neighborhood poverty (%)	16 (9–25)	22 (14–33)	19 (12–27)	9 (6–18)
Hollingshead Index score	43 (32–53)	41 (31–51)	35 (24–47)	50 (38–58)
Health nonliterate	40 (13%)	11 (11%)	22 (21%)	7 (7%)
Healthcare factors				
Pediatric care site	111 (37%)	15 (15%)	71 (69%)	25 (25%)
Self-reported clinic attendance ^b	4.3 (1.0)	4.1 (1.1)	4.3 (1.0)	4.5 (0.8)
Self-management				
Diabetes numeracy	4 (3–5)	4 (2–5)	4 (2–5)	5 (4–5)
Self-reported self-monitoring of blood glucose ^b	3.9 (1.1)	3.8 (1.1)	4.0 (1.2)	4.1 (1.0)
Total Self-Care Inventory score ^c	60.1 (17.6)	63.0 (13.5)	56.2 (18.9)	61.1 (19.3)

^aCurrent insulin pump and CGM use in past year.

^bSingle-item scores from Self-Care Inventory (range 1–5 on Likert scale).

^cTotal Self-Care Inventory score is on scale of 0–100.

Three-way comparisons between the racial and ethnic groups were performed for diabetes technology use: *NH White vs. NH Black, $P < 0.001$; **NH White vs. Hispanic, $P < 0.001$; ***Hispanic vs. NH Black, $P < 0.05$.

Data are reported as mean (95% CI), median (IQR), or n (%).

CGM, continuous glucose monitor; CI, confidence interval; IQR, interquartile range; NH, non-Hispanic.

$n = 70$) compared with NH Black (insulin pump: 18%, $n = 17$; CGM: 28%, $n = 27$) and Hispanic participants (insulin pump: 39%, $n = 40$; CGM 37%, $n = 38$) ($P < 0.001$) (Table 1). Hispanic participants had higher insulin pump use than NH Black participants (Table 1, Figure 1).

Insulin pump and CGM use. Adjustment for SES, demographics, study site, health care factors, and diabetes self-management attenuated percent use of insulin pump

and CGM, especially for CGM; however, significant disparities remained. Disparities were larger between NH Black and White YA than between Hispanic and NH White YA. Adjusted percent use of pump and CGM was 61% and 53% for NH White, 49% and 58% for Hispanic, and 20 and 31% for NH Black, respectively (Table 2, Figure 1). Information on percent use after adjustment for each individual factor is available in Supplementary Table S2.

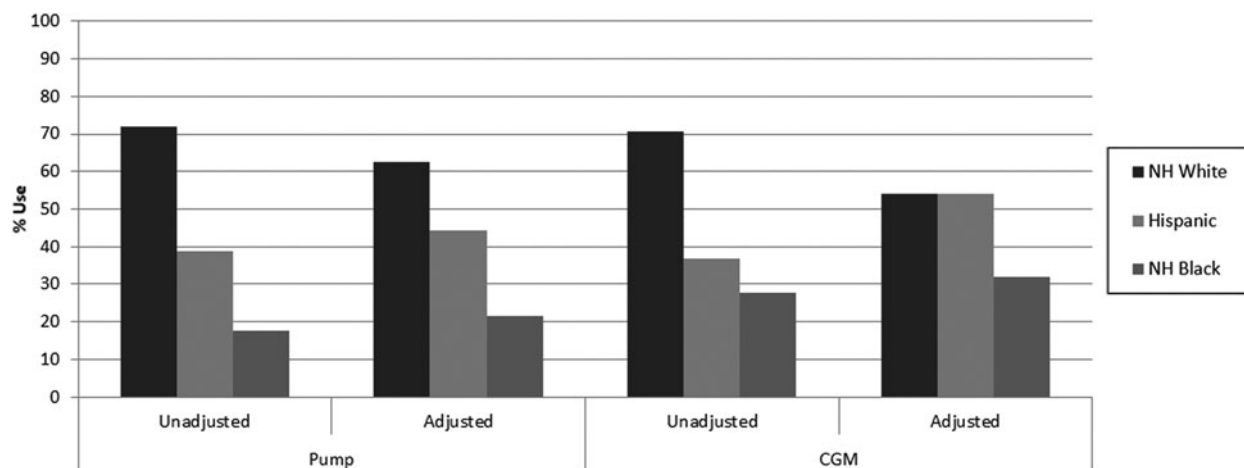


FIG. 1. Percentage of YA with T1D in each racial-ethnic group using insulin pump and CGM comparing unadjusted and fully adjusted estimates. Adjustment included: demographic and clinical variables, SES, healthcare factors, and diabetes self-management. CGM, continuous glucose monitor; T1D, type 1 diabetes; YA, young adults.

TABLE 2. UNADJUSTED AND FULLY ADJUSTED PERCENTAGE USE OF INSULIN PUMP AND CGM AMONG YOUNG ADULTS WITH TYPE 1 DIABETES BY RACE-ETHNICITY

	N	<i>Insulin pump use (95% CI)</i>			N	<i>CGM use (95% CI)</i>		
		<i>NH Black</i>	<i>Hispanic</i>	<i>NH White</i>		<i>NH Black</i>	<i>Hispanic</i>	<i>NH White</i>
Unadjusted	300	18% (14–21)	39% (34–44)	72% (68–77)	299	28% (23–32)	37% (32–47)	71% (66–75)
Fully adjusted ^a	245	20% (15–25)	49% (43–56)	61% (55–67)	244	31% (25–37)	58% (52–64)	53% (48–58)

^aFully adjusted percentages represent what the percentage use for insulin pump and CGM would be for each racial-ethnic group if the distribution of all factors was the same. Adjustment factors included age, sex, study site, insurance, education level, Hollingshead Four-Factor Index score, neighborhood poverty level, health literacy, SCI total score, diabetes numeracy, self-reported blood glucose monitoring frequency (SCI single-item score), self-reported clinic attendance (SCI single-item score), and pediatric vs. adult care site.

SCI, Self-Care Inventory.

Discussion

We found that insulin pump and CGM use was the lowest among NH Black, intermediate among Hispanic, and highest among NH White YA. We also importantly found that despite accounting for SES, demographics, health care factors, and diabetes self-management, significant disparities in insulin pump and CGM use remained, especially between NH Black and White YA. Lesser disparities remained between Hispanic and NH White YA, especially in CGM which was fully explained by adjusted factors. Our findings demonstrate several key points: (1) SES is not the main driver of racial-ethnic disparities in diabetes technology use as hypothesized previously, although we found a measurable effect; (2) there are differences in disparity patterns between NH Black and Hispanic YA, with much worse disparities among NH Black YA; and (3) other factors that may be related to socioeconomic position, such as clinic attendance and self-management, are not independently predictive of disparities in technology use. Overall, our findings contradict our hypothesis that SES would be the main driver of disparities and that secondary patient-reported factors related to SES would account for the remaining differences in use.

Numerous epidemiological studies have demonstrated racial-ethnic disparities in insulin pump and CGM use among children and adults with T1D, particularly among NH Black populations.^{2–5} Two studies using the T1D Exchange data of more than 22,000 children and adults with T1D demonstrated racial-ethnic disparities in insulin pump and CGM use, which importantly persisted in NH Black populations regardless of household income.² An international cohort study of 15,897 youth with T1D found that youth of minority status were more likely to be on a treatment regimen of multiple daily injections versus insulin pump, suggesting that racial-ethnic disparities in technology use are not unique to the United States.³ Furthermore, a study of 1,000 U.S. youth found that after 1 year of T1D diagnosis, high SES and White race were associated with higher insulin pump use,²⁰ indicating that disparities start early in the course of T1D and continue to propagate. While these studies have helped to build the foundation of work that underscores disparities in technology, our study adds to the existing literature by examining drivers of disparities beyond simple measures of SES.

We were surprised that health literacy, numeracy, income, and insurance level did not significantly attenuate disparities. Moreover, we did not expect clinical setting, clinic attendance, and self-monitoring of blood glucose to have such

small associations with disparities in use, especially because there were large differences in these measures between the racial and ethnic groups. One might expect that SES including income and insurance might affect the ability to purchase devices. In addition, low health literacy and numeracy as well as self-monitoring of blood glucose might preclude prescription for insulin pumps and CGM given perceived lack of the ability to manage advanced devices. Regarding care setting, receiving care in a pediatric clinic was hypothesized to be associated with higher prescriptions of technology, given more supportive infrastructure. Finally, low clinic attendance could reduce opportunities to discuss and prescribe technology. It is possible that our negative findings were due to an issue of self-report. For example, high self-reports of clinic attendance and blood glucose monitoring could have underestimated true estimates and therefore attenuated the relationship between these important self-management factors and technology use. However, it is also possible that there are unmeasured variables here that are more influential in technology disparities and need to be further studied.

A recent body of literature has emerged that explores the role of minority patient preferences for diabetes therapies and interventions, and may be particularly influential in the issue of technology disparities.^{21–23} One study of African American adults with type 2 diabetes qualitatively examined decisions and preferences for new diabetes medications and found that many patients had chosen to forego the latest therapies due to concerns about potential side effects. These African American study participants stated that their concerns were not routinely addressed by providers.²⁴ Another study of Hispanic adults with type 2 diabetes examining preferences for diabetes behavioral interventions found a predilection for programs that engaged families and peers to mimic the bonds they feel with family members.²⁵ Finally, in a study of African American and White adults with type 2 diabetes, African Americans who reported no hurried communication with providers had lower HbA1c levels compared with those who did not, while provider communication had no association with glycemic control in the White group.²⁶ These studies suggest that minority patient preferences for diabetes treatments and communication strategies may be vitally important, and health care approaches need to take into account the unique cultural and historical contexts of certain minority groups for effective uptake of new therapeutics. Extending to minority YA and diabetes technology, these studies suggest that a tailored and culturally sensitive

approach should be encouraged when introducing and discussing diabetes technology. Future studies need to more deeply examine minority group preferences with regard to emerging diabetes technologies to not only guide patient–provider discussions but also incorporate representative input into the development of these therapeutics to increase acceptability.

Equally important to consider is the role of the health care provider in creating disparities. Several studies have demonstrated that health care racism and implicit bias exist, even in well-meaning engaged providers.^{27,28} Studies examining prescribing patterns of psychotropic medications, statins, and antihypertensives all show disparities, favoring White populations.^{29,30} A recent qualitative study in the United Kingdom exploring provider referral for closed-loop insulin pump therapy demonstrated that providers unintentionally deemed patients of low SES and/or racial–ethnic minority as less appropriate for closed-loop technology.³¹ Just as systemic racism exists in other parts of society, so does it exist in the health care setting. Thus, standards of care and pathways to technology use need to be adapted to avoid enabling bias. While recognition of implicit bias is important, studies have shown implicit bias training or increased awareness as ineffective in mitigating provider behaviors.^{28,32,33} Thus, larger changes may be needed. Modifying systems of care to promote equal opportunity and access to technology options will be critical. For example, designing prescription pathways for technology that lie outside the provider could escape the provider-prescription implicit bias cycle and reduce racial–ethnic disparities in technology use. Additionally, ensuring equal access to technology education options for all people with T1D could empower patients themselves to approach providers and initiate technology. Moreover, introducing every clinic patient to diabetes technology in a standardized and trackable manner would further eliminate favoritism and bias.

Lastly, patient-provider therapeutic relationships have been shown to affect disparities in care, particularly with regard to shared decision-making. YA are especially vulnerable during the transition from pediatric to adult care and have low clinic attendance and suboptimal therapeutic relationships with providers. Studies have shown that engendering trust and promoting shared decision-making improve communication, disrupt clinical inertia, enhance patient engagement, and increase visit attendance in addition to increasing CGM use.^{34–36} For minority populations, who are particularly vulnerable to fractured health care relationships given long histories of mistrust in medical systems, patient–provider relationships may be a pivotal milestone to increase uptake of diabetes technology use. Thus, ways to foster trust and collaboration such as use of goal-setting should be developed. Low literacy materials have been shown to be associated with increased adoption of insulin pump and CGM use, providing an example of “meeting the patient where they are” to encourage new therapeutic use.³⁷ In sum, diabetes health care providers will need to redesign and refocus care paradigms to embrace patient-centered care and adopt culturally sensitive approaches to overcome disparities in insulin pump and CGM use.

This study has several limitations. First, it is cross-sectional, which limits the ability to make causal inferences. However, this one-time data capture design was specifically

chosen to maximize recruitment of a population that is severely underrepresented in research. Moreover, our key predictor variable, race–ethnicity, clearly chronologically preceded the outcomes under study, making a longitudinal study design less necessary. Second, some of our variables, such as blood glucose monitoring and clinic attendance, were self-reported and may not represent true estimates. Nevertheless, inclusion of patient-reported variables in our analysis is novel and offers a first step to better understanding the role of these constructs in disparities. Third, we did not include measures of racial discrimination or perception of implicit bias, ratings of patient–provider relationship, or cultural acceptance of new treatments as potential explanatory variables, however they could have been particularly influential for racial–ethnic disparities. Future work must examine these important variables and their relationship to disparities in technology use.

In conclusion, there are large disparities in insulin pump and CGM use among NH Black and Hispanic YA with T1D compared with NH White YA, which were not fully explained by SES, demographics, health care factors, or diabetes self-management. Disparities were largest between NH Black and White YA, even after adjustment for multiple factors. Minority patient preferences, health care provider implicit bias, mistrust of medical systems, and patient–provider relationships need to be more fully explored as contributors to disparities in insulin pump and CGM use. In addition, systems-based, culturally tailored, and standardized approaches are needed to provide equal opportunities to obtain and use diabetes technology. As the pace of innovation in diabetes technology accelerates and raises standards of care in T1D, understanding and eliminating disparities in use of these important new therapeutics is crucial to overcoming and disrupting the cycle of inequity in long-term outcomes for minority T1D populations.

Authors' Contributions

S.A. conceptualized and designed the study, researched the data, and wrote the article. C.S. analyzed the data, wrote, and edited the article. J.G. edited the article and contributed to the discussion. J.A.L. conceptualized and designed the study, researched the data, edited the article, and contributed to the discussion.

Acknowledgments

We acknowledge the site study staff and participants in the YARDD study.

Author Disclosure Statement

None of the authors have anything to disclose related to this research.

Funding Information

Funding for this study includes support from the National Institute of Diabetes and Digestive Kidney Diseases (#K23DK115896 and #P-30DK111022) as well as the Leona M. and Harry B. Helmsley Charitable Trust pilot award through the T1D Exchange.

Supplementary Material

Supplementary Table S1

Supplementary Table S2

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