



Equity in Medical Care for People Living With Diabetes

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Disparities and inequities exist for individuals with diabetes in marginalized communities of color, especially among people with low socioeconomic status. Although these barriers are apparent, only a few care models have been designed for and examined in racially and ethnically diverse individuals. This article reviews models that have been developed and examined in a variety of different populations and focuses on how to implement elements from these programs in clinical practice. Health equity-promoting ideas and approaches that can be applied throughout the life span (children to seniors) are also included. As diabetes health care providers, researchers, educators, policymakers, and advocates, we must now combine our efforts and focus on historically excluded populations to bridge the gap to essential diabetes care.

Health inequity in the treatment of people with diabetes is a longstanding issue that has become more apparent in light of the coronavirus disease 2019 pandemic. Although health disparities for people with diabetes can begin in childhood and continue throughout the life span, research conducted with people with type 1 diabetes has primarily focused on non-Hispanic White adults, whereas research involving people with type 2 diabetes tends to include more diverse populations. Studies have highlighted that racially and ethnically diverse individuals encounter numerous barriers to receiving equitable care and face greater challenges with access and affordability.

Marginalized populations are less likely to use intensive approaches to care (e.g., continuous glucose monitoring [CGM], insulin pumps, and newer medications) and have worse diabetes outcomes than their non-Hispanic White peers (1–4). Additionally, approaches to and delivery of care and technology disparities are influenced by care providers' implicit and explicit biases (e.g., competency stereotypes of capability with diabetes self-management) toward communities of color (1,2,5). As a result, members of historically excluded communities often experience medical trauma and distrust of the health care system (6). Increased access to diabetes technology, medications, and follow-up care is needed to promote care equity for all people with diabetes. Although gaps in the literature exist, there are data supporting several clinical care models that are well positioned to address the systemic issues that negatively affect care for people in marginalized communities.

This article reviews five main areas in which new or modified care approaches may improve outcomes for racially and ethnically diverse populations: 1) changing diabetes health care delivery to improve access and outcomes with interventions designed specifically for marginalized communities, 2) addressing implicit bias in medical care, 3) expanding access to new therapeutics and technology, 4) reducing disparities in the development of diabetes-related complications, and 5) lowering medication costs. We provide suggestions and methods to adapt existing models to meet the specific needs of marginalized populations, while acknowledging that individualization of care that incorporates personal preferences and choices is crucial and that no one solution applies to all.

Changing Diabetes Health Care Delivery to Improve Access and Outcomes

Improving Access to High-Quality Care

Lack of adequate access to appropriate specialized care is a problem for under-resourced communities and marginalized individuals with diabetes who may rely on safety-net primary care (7). Many individuals experience barriers to attending clinic visits, including lack of transportation, difficulties with scheduling, jobs without benefits or time off, and competing demands such as caregiving for other family members. As health care advocates and clinicians, we must be aware of these challenges. Clinicians and educators should perform a needs assessment for the people with diabetes to whom they provide services. These

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crucial assessments include taking a thorough health history; assessing cognition, functional health literacy and numeracy, diabetes distress, and support systems; and gaining an understanding of religious and cultural influences, health beliefs and attitudes, physical limitations, barriers, and social determinants of health (e.g., low financial resources and risk of food and housing insecurity) (8). Additionally, we must practice acceptance and empathy to improve satisfaction with visits and decrease anxiety for people with diabetes (9). Finally, we should create care systems with staff and clinicians who are members of the local communities we serve, as people respond best when they receive care from clinicians with whom they share life experiences (10,11).

Assisting With Transportation and Appointment Scheduling

As adults age, mobility, comorbid illnesses, low technology literacy, lack of resources, and/or environmental factors may impede their access to diabetes care (12). A successful intervention to improve access to and attendance at clinic visits for adults with diabetes is to implement automated or personalized telephone reminders, which has been found to enhance appointment making and increase attendance (13). Another solution is to provide or arrange for transportation for people who need it. Ride-sharing programs to address health care transportation barriers are often available to improve access for adults and seniors with diabetes. Specific examples include the Diabetes Foundation Transportation Assistance Program, which partnered with Lyft to offer free transportation assistance (14). Uber Health also offers a program through which people in need can get free rides to appointments when participating health care organizations or clinics agree to cover the cost (15). Finally, many state Medicaid agencies pay for public transportation to medical appointments on a per-visit basis.

Focusing on Transitions in Care

Guidelines for the provision of diabetes self-management, education, and support (16) outline the four most critical times to offer these services, including 1) at diagnosis, 2) annually and/or when a person is not meeting treatment targets, 3) when complicating factors develop (e.g., diabetes-related complications, a need for steroids, preconception planning, or pregnancy), and 4) when transitions in life and care occur. Changing from pediatric to adult care is a particularly problematic transition during which youth who previously achieved glucose targets can end up lost to follow-up, with serious health consequences (17).

In Los Angeles, CA, the LEAP (Let's Empower and Prepare) program was designed to provide structured diabetes

transition support (e.g., tailored diabetes education and improved access) for marginalized young adults with type 1 diabetes (18). This program led to improved glycemic outcomes, fewer hypoglycemic events, and increased psychosocial well-being for intervention participants. It also increased the likelihood that participants would find an adult care provider. Inclusion of a health care navigator who assisted young adults in their care transition and thereby ensured that there was no gap in the services, played a key role in the intervention's success (18).

Other programs have had success with similar navigator approaches. The Diabetes Community Care Ambassador Program (19) was designed specifically for marginalized communities and addressed the needs of youths with diabetes by combining diabetes care, education, and legal aid. Likewise, the Novel Interventions in Children's Healthcare (NICH) program reduced disparities by providing trained interventionists (via a family systems approach) to assist young adults in navigating the health care system and helping with other social needs (20).

Addressing Health Literacy

Simplifying educational materials to make them relevant to diverse learners may improve diabetes management. A small pilot study supporting CGM use adapted appropriate educational materials for predominantly Hispanic adults with type 1 diabetes who had low health literacy, limited diabetes knowledge, and limited experience with technology (21). Participants received intensive instruction in CGM use and regular follow-up for 21–22 weeks. Although A1c, time in the glycemic target range, and time below range did not significantly improve, most participants (80%) opted to continue CGM use after the study. A second investigation in predominantly low-income Hispanic adults with type 1 diabetes (22) provided targeted educational materials to overcome literacy barriers in teaching technology skills. The use of these educational guides was associated with improvements in participant-reported health-related quality of life and a reduction in diabetes-related ketoacidosis (DKA), but not glycemic levels. These results support the need for tailored educational materials to improve access to beneficial treatments and technology for members of high-risk groups.

Providing Clinician Education and Specialty Care Resources

Project ECHO (Extension for Community Healthcare Outcomes) bridges access issues for people with diabetes by providing diabetes specialist mentors to primary care clinicians. These specialist mentors support the clinicians in developing expertise to manage various aspects of

diabetes care (23,24). The current shortage of endocrinologists who treat adults makes expanding access to specialty care support even more crucial (25). This model of care is an effective tool for decreasing disparities by removing geographic barriers and reducing clinicians' knowledge gaps. A Project ECHO T1D pilot program in Florida and California added diabetes support coaches to the existing Project ECHO model. It demonstrated improvement in diabetes knowledge and confidence for participating primary care providers (26). By adding diabetes support coaches, Project ECHO T1D may combat disparities in access to specialists and offer more psychosocial support to people with diabetes.

Adopting Nonphysician Care Models

Providing care outside of the traditional medical model can also have a positive impact on communities of color. Pharmacist-led programs can be an added resource to provide more diabetes support and education at the point of care. Many members of underserved populations interact more with pharmacists than with medical providers as a touchpoint in care (27). Mental health professionals, including social workers and psychologists, can also assist people in dealing with various life and mental health challenges that affect their diabetes management.

Community health workers (CHWs) and community-based care models have successfully improved diabetes care and health-related behaviors in historically excluded populations. For example, the I Am Woman (IAW) program is a community-based model designed to support health-related behavior changes among Black women with prediabetes or diabetes (28). The IAW program's targeted intervention emphasizes nutrition and physical activity. The CHWs who facilitate program sessions live in the same communities as the participants and thus are uniquely positioned to provide health-related information to community residents.

Faith-based programs have also shown benefits in some communities, particularly programs geared to lowering the risk of developing diabetes (29,30). Two established programs support the value of Black churches as essential venues for improving diabetes care. These include Project FIT (Faith Influencing Transformation), an intervention focused on weight loss (31), and A New DAWN (Diabetes Awareness & Wellness Network), both of which are church-based diabetes management programs designed for Black people with type 2 diabetes (32).

Two models of care serve as examples of helpful frameworks for individual- and population-level disease management among Hispanic adults with diabetes. Project Dulce (33) was designed primarily for high-risk Hispanics with diabetes (high baseline A1C and less than an eighth-grade education). Through the

Project Dulce model of providing culturally sensitive, community-based, peer-led education, participants gained in both health status and diabetes knowledge. Project Dulce combined nurse case management and group education delivered by peer educators to achieve self-empowerment. Nurse-led teams included bilingual/bicultural medical assistants and dietitians who traveled to clinic sites. The positive impact of Project Dulce has provided insight into crucial components of diabetes care within Hispanic populations.

A population-based effort in an impoverished border community of Hispanics with type 2 diabetes also provided essential lessons (34). This 20-year research program in Starr County, TX, featured an approach that was culturally tailored in terms of language, dietary preferences, social emphasis, family involvement, and cultural beliefs, while also being sensitive to the generally lower socioeconomic status (SES) of participants. A key component was using Spanish-speaking *promotoras* (lay CHWs) to serve as community liaisons, advocates, educators, mentors, outreach workers, role models, and translators. Interestingly, during focus groups with community members with diabetes, researchers learned that having *promotoras* lead the intervention sessions was unacceptable to participants, who preferred having a health care professional. The crucial takeaway from this 20-year research experience was that community acceptability of the *promotora* role needed to be assessed before program implementation, highlighting the importance of stakeholder involvement early in intervention development.

Implementing Virtual Diabetes Care

Although telehealth has been shown to improve quality of care and increase access for rural and urban pediatric and adult populations with diabetes, concerns remain regarding historically excluded communities (35). For adults ≥ 65 years of age, telehealth-related concerns include possible hearing difficulties, problems speaking or making themselves understood, and dementia (36,37). Fortunately, telehealth studies of individuals with diabetes have indicated that these services provide promising opportunities to reach medically marginalized people. For youth and young adults with diabetes, telehealth models increase access to diabetes care and improve outcomes (e.g., lowering A1C, increasing clinic attendance, and reducing diabetes-related distress) by including flexible connectivity locations, technological support, and enhanced care consistency (e.g., one clinician for all visits) (38–42).

A recent study demonstrated that telehealth visits can effectively provide care for adults with type 1 diabetes who live in rural areas (43). Additionally, a systematic review analyzed a subset of studies on telehealth interventions in Black and Hispanic adults with type 2 diabetes and found reductions

in A1C over an average of 9 months (44). In Houston, TX, the TIME (Telehealth-Supported, Integrated Community Health Workers, Medication-Access) program (45) combined strategies for low-income Hispanics with type 2 diabetes whose mean age was 55 years in a 6-month intervention followed by 6 months of CHW follow-up to bridge care. Three-hour CHW-led monthly telehealth group visits were coupled with large-group diabetes education sessions, small-group breakout sessions, healthy meal education, and a 1:1 medical encounter with a provider for 6 months. At month 7, participants returned to usual in-person care with their provider and continued contact with the CHW. A post-intervention assessment showed sustained A1C and blood pressure reductions for 2 years after the CHW follow-up period ended. Another telehealth study involving Black (15%) and Hispanic (35%) seniors with type 2 diabetes and a mean age of 71 years, showed greater engagement in diabetes self-care with telehealth compared with usual care (37). The 5-year intervention included telehealth visits with nurse case managers and dietitians every 4–6 weeks and the ability to upload blood glucose and blood pressure measurements. These results support the long-term benefits of implementing telehealth services in routine clinical settings for people in all age-groups.

Embracing Person-Centered Care and Shared Decision-Making

Person-centered care (PCC) and shared decision-making (SDM) are care models that promote collaboration between people with diabetes and their care providers and have the potential to mitigate disparities, including lower uptake of diabetes technology, less frequent prescription of intensive therapy plans, and disparate psychosocial outcomes (46–48). Two examples of programs that incorporate PCC and SDM are Team Clinic (49) and the Colorado Young Adults With Type 1 Diabetes (CoYoT1) Clinic (50). Although these models were not originally designed specifically to address disparities, diabetes technology use increased among participants receiving the interventions, while psychosocial outcomes improved and clinic attendance increased.

Outcomes from the initial studies of these models created a path to adapt them for a marginalized, historically excluded population through a multistep process. We assembled diverse stakeholder groups, including diabetes care providers and clinic staff such as diabetes nurse educators and dietitians, social workers, and hospital administrators. These stakeholders guided the design and core elements of the models, focusing on PCC and SDM. Four data sources were used to adapt CoYoT1 Clinic for a racially and ethnically diverse population (50). In addition to the results of the pilot study, we gathered information from an

advisory board of people with diabetes, stakeholder focus groups, and an assessment of the population of interest to develop collaborative tools (39,50). The research team formalized SDM and collaborative action-planning tools and provided clinician training focused on autonomy-supportive communication strategies (50). The advisory board and other stakeholders recommended structured collaborative care tools (50) and emphasized the need for summaries of care plans from clinic visits, specific group topics, and family involvement. The advisory board also recommended enhancing telehealth and diabetes data platforms, and other stakeholders suggested scheduling processes and methods of connecting with families (50). Preliminary evidence shows that PCC and SDM are beneficial in predominately publicly insured populations of color (J.K.R., unpublished observations).

Models within and outside of routine clinic settings (e.g., Supporting Emerging Adults With Diabetes [51] and the previously mentioned NICH [20], LEAP [18], Project ECHO [23,24], and Project Dulce [52] programs) have been designed to reduce disparities and meet the needs of specific populations using PCC based on participants' preferences and values. In addition, the Latino Clinic, a model featuring culturally sensitive shared medical appointments for Spanish-speaking or bilingual Latino families and youth in Colorado, led to reduced A1C and increased diabetes technology uptake (53). Finally, Teen Power, group intervention for youth with type 1 diabetes, resulted in improved psychosocial functioning and diabetes management and reduced diabetes-related distress in caregivers while addressing participants' unique cultural needs (54). Teen Power also resulted in higher self-efficacy scores and was associated with lower levels of depressive symptoms in participating youth (55).

Identifying and Eliminating Implicit Bias

A recent study suggested that implicit bias is reflected in prescription practices for diabetes technology (56). In a diverse population of adults (≥ 18 years of age) with type 1 diabetes (25% Black and 15% Hispanic), more than half of White participants used diabetes technology compared with less than one-third of non-White participants. The authors found that sociodemographic factors such as annual household income and language spoken did not appear to be the primary drivers of this disparity, raising the question of provider-level factors, including implicit bias. Another study of pediatric type 1 diabetes care providers in the United States identified implicit bias against individuals with public insurance with regard to diabetes technology recommendations (57).

Evidence-based information on ways to reduce individual providers' bias is lacking. There is no consensus regarding

how to teach clinicians about implicit bias as it relates to disparities in the provision of health care. More studies using real-world interaction measures may help to elucidate the actual behavior of health care professionals in this regard (58).

Meanwhile, although not specific to people with diabetes, a few interventions have shown promise (59). As part of an effort to increase medical students' awareness and understanding of health disparities, Albert Einstein College of Medicine designed a program requiring students to examine their own experiences and explore their own biases (59). The results support the value of teaching medical students to recognize their own implicit biases and develop skills to overcome them. Another program called *Yo Veo Salud*, which specifically targeted implicit bias against Hispanics, used a visual approach with narrative photography to increase ethnocultural empathy, physician empathy, and person-centeredness among medical residents to reduce implicit bias (60). In its pilot study, medicine and pediatrics residents viewed a series of photographs that chronicled the migration journey of a young girl and her family and attended a Photovoice forum (61) to view photos and videos created by Hispanic adolescents in response to the prompt, "What I wish my doctor knew about my life." All participants completed an online survey and a visual sequential priming exercise, while a comparison group had no exposure to the intervention components (pictures or videos). The intervention group showed higher scores than the comparison group on all three self-report outcomes.

Future research is needed to find additional effective ways to teach students in health care fields and physicians to recognize their implicit biases and mitigate their impact on prescribing behavior and clinical decision-making.

Expanding Access to New Therapeutics and Technology

Racially and ethnically diverse people living with diabetes are less likely to use intensive treatment approaches (e.g., CGM, insulin pump therapy, multiple daily injections, and newer medications) and often experience therapeutic inertia—a lack of timely adjustment to therapy when treatment goals are not met (2,62–67). Clinician and health system biases and racism contribute to stereotypes regarding competency, resulting in stark differences among diabetes treatment plans for non-Hispanic Whites, Latinos, and non-Hispanic Blacks (1,2,63).

One of the most effective ways to reduce therapeutic inertia is to empower care team members (e.g., nurses, pharmacists, and diabetes educators) to initiate or intensify treatment plans. This model has been shown to reduce A1C in people with type 2 diabetes (68). Barriers to CGM uptake and

continuation among adults with type 1 diabetes and low SES have been addressed in this manner, with provision of intensive instruction in CGM use and regular follow-up (21). For youth and young adults, offering culturally sensitive group appointments is another way to overcome therapeutic inertia. The previously mentioned Latino Clinic for Spanish-speaking or bilingual Latinos (53) not only reduced A1C levels, but also increased diabetes technology use.

The use of newer diabetes-related technology (e.g., CGM systems and insulin pumps) in seniors has been found to lower A1C and reduce the risk of hypoglycemia (69,70). However, ageism may cause hesitancy to prescribe diabetes technology to seniors. In addition, most assessments of technology use in seniors with diabetes include predominantly non-Hispanic Whites. Little is known about the potential barriers to accessing, adopting, and using technology or differences in providers' prescribing practices for racially and ethnically diverse older adults.

One starting place to improve seniors' access to diabetes technology in the United States would be to address the challenges posed by Center for Medicare & Medicaid Services (CMS) guidelines for insulin pump therapy for adults with type 1 diabetes (71,72). Even in a cohort of well-educated, predominantly White individuals with well-managed type 1 diabetes, 56% reported difficulties obtaining supplies, with obstacles including problems getting paperwork completed (24%), scheduling the required face-to-face visit every 90 days (18%), arranging other needed appointments (12%), and keeping scheduled appointments because of inclement weather, illness, lack of transportation, or appointment canceling or rescheduling by health care providers (8%) (72). This evidence shows that current CMS requirements to ensure uninterrupted insulin pump therapy present challenges to most Medicare/Medicaid recipients with type 1 diabetes and often lead to delays or interruptions in pump therapy. More lenient eligibility criteria and requirements for using these advanced systems are imperative to prevent widening disparities.

Reducing Disparities in Rates of Diabetes-Related Complications

Diabetes-related complications, including both acute complications such as DKA and chronic micro- and macrovascular conditions, are more prevalent among racial and ethnic groups with low SES (73,74).

Some programs have been developed to reduce DKA events and hospital admissions for youth and young adults with type 1 diabetes by implementing a family systems approach and risk screening. These models, including NICH and

other quality improvement projects (20,75,76), and can be implemented at or adapted for other institutions.

As an example of disparities in long-term diabetes-related complications, Black and Hispanic adults have higher rates of diabetes-related retinopathy than their non-Hispanic White counterparts (74). Some interventions that have improved and expanded access to retinal screenings among racially and ethnically diverse adults used a telehealth model and nonmydriatic cameras (77–79). These studies have demonstrated the efficacy of detecting diabetes-related retinopathy via remote specialist interpretation of retinal images taken in primary care clinics. Another simple intervention that involved setting up a free, community-based retinopathy screening clinic improved the number of Black participants with diabetes who returned for subsequent annual screenings (80). Individuals who received a letter and a telephone call from project staff encouraging them to return for a dilated eye exam were more likely to return than those who received a letter alone (66 vs. 35%).

Helping to Lower Medication Costs

Direct financial costs related to medications and supplies place an additional burden on members of marginalized communities, and cost is the most cited reason for not taking prescribed medications (81,82). Sadly, more than one-third of people who underuse insulin because of cost concerns do not discuss this barrier with their provider (83). These findings are consistent with prior studies suggesting that more than one-third of people do not speak to their clinicians about prescription drug costs (84–86). Often, people say that stigma related to the potential inability to pay is a barrier to initiating such discussions, and clinicians cite a lack of knowledge regarding prices (84–86).

A person-centered approach is needed to respond to the challenges of high medication costs (87). What are the person's acute financial needs? Does the person need assistance with budgeting or planning? Is cost a factor in a necessary clinical decision? At the core of cost-of-care conversations is discussion of the pressures individuals with diabetes and their families might face from both direct out-of-pocket expenses and indirect costs (e.g., lost wages from absenteeism and child care and transportation costs for medical appointments). Resources are available to aid providers in these discussions (88).

Once cost conversations occur, connecting people to available resources is the next best step (89). One recognized approach is to share information about websites and digital apps for accessing the current cash payment prices of prescription drugs at local pharmacies. By helping to locate the lowest available prices, these sites and apps can potentially lower out-of-pocket costs for under- and uninsured people with diabetes

(90). Resources such as GoodRx (<https://www.goodrx.com>) and RxSaver (<https://www.rxsaver.com>) remove barriers to communication with providers about cost issues and may facilitate increased medication taking (91).

The devastating consequences of rising out-of-pocket costs for people with diabetes include taking less medication than prescribed and rationing insulin. Data from GoodRx cast light on the urgent need to lower the cost of insulin in the United States. The use of GoodRx consumer coupons for rapid-acting insulins aspart and lispro increased from 2018 to 2022 at a rate 50% faster than the use of coupons for other medications (T. Marsh, unpublished observations).

Incorporating Patient Engagement Strategies

Medication-taking is a tenet of optimal diabetes self-management and outcomes; however, many underserved populations face numerous challenges. The pharmacy presents an important area of contact and opportunity for improvement in medication-taking. In a predominantly Hispanic population with diabetes, participants preferred both written (52.5%) and verbal (52.5%) communication in Spanish from their pharmacies (82). Although cost was the most common reason cited for not taking medications, “no refills” was the second (20.3%). These findings serve as a reminder that simply asking a question or reviewing the prescription label may provide pharmacists and providers with a status update on medication supply. Providers often require people to contact the pharmacy first to request prescription refills. Pharmacists could check a person's pill bottles, determine the refill status for each prescription, and help to make refill requests in advance, before the supply runs out.

Although studied in a majority White (88%) population with type 2 diabetes, rates of consistently taking sodium–glucose cotransporter 2 (SGLT2) inhibitors and glucagon-like peptide 1 (GLP-1) receptor agonists are discouraging (92). One in three people newly prescribed an SGLT2 inhibitor or a GLP-1 receptor agonist did not fill their prescription within 30 days, with Black race being a predictor of low medication-taking rates. Individuals who were under the care of an endocrinologist had higher medication-taking rates, leading the authors to suggest that this may reflect a greater awareness among endocrinologists of which brand-name products are covered by insurance plans or of endocrinologists' ancillary staff being better equipped to secure prior authorization for these classes of medications.

Concerns regarding the negative effects of diabetes medications are prevalent among Hispanics with low-income status (33). Despite this concern, interventions that improved medication-taking included a provider addressing it and family support

with reminders and help to arrange medicines. These findings support simple strategies to overcome hurdles, including educating providers about how individuals' medication-related beliefs can affect medication-taking. In addition, routinely inquiring about patients' medication-taking (e.g., "Are you taking your medications every day?") and engaging family members as a support system are crucial.

Although cost remains a strong barrier, it does not fully explain low medication-taking rates. In an older population of Medicare recipients with diabetes who are part of the low income subsidy program that reduces premiums and copayments, racially and ethnically diverse individuals still had a higher likelihood of not taking medications consistently (93). Strategies to reduce diabetes-related distress may improve glycemic targets, in part through increasing consistent medication-taking. A study attempting to reduce emotional distress in rural Black women with type 2 diabetes and elevated A1C demonstrated a potential means of improving medication-taking (94). The study assessed EMPOWER, a 16-session peer advisor telephone-delivered lifestyle intervention, and found that reducing emotional distress in this high-risk population was associated with reductions in A1C, more consistent medication-taking, and improvements in other behavioral correlates of self-care.

Considerations for Pediatric Versus Adult Populations

Although pediatric and adult populations with diabetes encounter similar barriers to care, certain considerations are especially relevant to each phase of life. Pediatric populations may have more access to specialty care than do adults. Yet, many barriers create complex challenges because specialty care providers and health care institutions may not be equipped to address social determinants of health or deliver culturally responsive care. Often, family challenges filter down to children; therefore, contextualized family approaches need to be implemented.

Many middle-aged adults with diabetes, particularly those in under-resourced locations, are treated by primary care providers because of a lack of endocrinologists and specialty diabetes centers in their area. Telehealth can expand specialty care by developing culturally appropriate programs and delivering them remotely for individuals in need. Insurance coverage for adults can be problematic, and without universal health care coverage, many adults may lose coverage when their job or income changes. Safety-net systems help but rarely provide intensive diabetes management. Beyond insurance limitations, adults face many other barriers such as lack of child care, food insecurity, job loss, lack of access to affordable housing, the need to provide care for family members,

divorce, incarceration, and abuse. It is essential to recognize that these and other barriers can make complex diabetes management daunting and nearly impossible, even for people who are given diabetes devices and other tools in an effort to help them achieve and maintain glucose targets.

Seniors in the United States generally have access to diabetes devices, insulin, and health care services through Medicare; yet, few studies have assessed these types of access among seniors in marginalized populations. Unfortunately, seniors often face serious complications and reduced life expectancy if they have not achieved and maintained glucose targets earlier in life. As people with diabetes age, they may need more help from caregivers, who need a firm grasp of current diabetes education and management processes.

Conclusion

Alternative care models are available and provide a framework for addressing the needs of ethnically and racially diverse populations with diabetes. PCC, SDM, and culturally sensitive education and interventions, combined with telehealth services, have been proven effective and should be incorporated when designing processes for the delivery of diabetes care services. Based on our experiences, programs such as CoYoTi (50) and Team Clinic (49) are paving the way for adapting programs for the pediatric population with input from stakeholders in marginalized communities of color and a rigorous, multistep process. Building on our experience and collaboration with statewide stakeholders, CoYoTi Clinic is now being adapted and formalized into a generalizable toolkit for new projects. LEAP (18), Latino Clinic (58), and Teen Power (54) are additional examples of effective programs to promote health equity among racially and ethnically diverse young adult populations in urban settings. Innovative care delivery models such as Project ECHO (23) and Project ECHO T1D expand access and improve health care quality in adult populations.

As outcomes continue to worsen in underserved communities and disparities widen, researchers must shift gears and to focus on health care models and programs that promote access and high-quality care for racially and ethnically diverse and low-SES individuals with diabetes.

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AUTHOR CONTRIBUTIONS

J.F.G. and S.O. researched data, reviewed the literature, and wrote the manuscript. A.L.P. and J.K.R. contributed to, reviewed, and edited the manuscript. All authors contributed to the discussion. J.F.G. is the guarantor of this work and, as such, had full access to all the data included and takes responsibility for the integrity of the data and the accuracy of the review.

REFERENCES

- Valenzuela JM, La Greca AM, Hsin O, Taylor C, Delamater AM. Prescribed regimen intensity in diverse youth with type 1 diabetes: role of family and provider perceptions. *Pediatr Diabetes* 2011;12:696–703
- Willi SM, Miller KM, DiMeglio LA, et al.; T1D Exchange Clinic Network. Racial-ethnic disparities in management and outcomes among children with type 1 diabetes. *Pediatrics* 2015;135:424–434
- Baghikar S, Benitez A, Fernandez Piñeros P, Gao Y, Baig AA. Factors impacting adherence to diabetes medication among urban, low income Mexican-Americans with diabetes. *J Immigr Minor Health* 2019;21:1334–1341
- Xie Z, St Clair P, Goldman DP, Joyce G. Racial and ethnic disparities in medication adherence among privately insured patients in the United States. *PLoS One* 2019;14:e0212117
- Peek ME, Wagner J, Tang H, Baker DC, Chin MH. Self-reported racial discrimination in health care and diabetes outcomes. *Med Care* 2011;49:618–625
- Williams DR, Lawrence JA, Davis BA. Racism and health: evidence and needed research. *Annu Rev Public Health* 2019;40:105–125
- Safety Net Center. Safety net facilities help vulnerable populations manage their diabetes care. Available from <https://www.safetynetcenter.org/educational-resources/clinical-resources/diabetes>. Accessed 13 March 2022
- American Diabetes Association Professional Practice Committee. 4. Comprehensive medical evaluation and assessment of comorbidities: *Standards of Medical Care in Diabetes—2022*. *Diabetes Care* 2022;45(Suppl. 1):S46–S59
- Howick J, Moscrop A, Mebius A, et al. Effects of empathic and positive communication in healthcare consultations: a systematic review and meta-analysis. *J R Soc Med* 2018;111:240–252
- Shen MJ, Peterson EB, Costas-Muñiz R, et al. The effects of race and racial concordance on patient-physician communication: a systematic review of the literature. *J Racial Ethn Health Disparities* 2018;5:117–140
- Health Resources & Services Administration. The rationale for diversity in the health professions: a review of the evidence. Available from <https://docplayer.net/255577-The-rationale-for-diversity-in-the-health-professions-a-review-of-the-evidence.html>. Accessed 3 March 2022
- Leung E, Wongrakpanich S, Munshi MN. Diabetes management in the elderly. *Diabetes Spectr* 2018;31:245–253
- Nuti L, Turkan A, Lawley MA, Zhang L, Sands L, McComb S. The impact of interventions on appointment and clinical outcomes for individuals with diabetes: a systematic review. *BMC Health Serv Res* 2015;15:355
- Diabetes Foundation. Diabetes Foundation debuts transportation assistance program to help participants reach appointments and other essential services. Available from <https://diabetesfoundationinc.org/transportation-assistance-debut>. Accessed 3 March 2022
- Uber Health. Care begins with getting there. Available from <https://www.uberhealth.com>. Accessed 3 March 2022
- Powers MA, Bardsley JK, Cypress M, et al. Diabetes self-management education and support in adults with type 2 diabetes: a consensus report of the American Diabetes Association, the Association of Diabetes Care & Education Specialists, the Academy of Nutrition and Dietetics, the American Academy of Family Physicians, the American Academy of PAs, the American Association of Nurse Practitioners, and the American Pharmacists Association. *Diabetes Care* 2020;43:1636–1649
- Peters A; American Diabetes Association Transitions Working Group. Diabetes care for emerging adults: recommendations for transition from pediatric to adult diabetes care systems: a position statement of the American Diabetes Association, with representation by the American College of Osteopathic Family Physicians, the American Academy of Pediatrics, the American Association of Clinical Endocrinologists, the American Osteopathic Association, the Centers for Disease Control and Prevention, Children with Diabetes, The Endocrine Society, the International Society for Pediatric and Adolescent Diabetes, Juvenile Diabetes Research Foundation International, the National Diabetes Education Program, and the Pediatric Endocrine Society (formerly Lawson Wilkins Pediatric Endocrine Society). *Diabetes Care* 2011;34:2477–2485
- Sequeira PA, Pyatak EA, Weigensberg MJ, et al. Let's Empower and Prepare (LEAP): evaluation of a structured transition program for young adults with type 1 diabetes. *Diabetes Care* 2015;38:1412–1419
- Malik FS, Yi-Frazier JP, Taplin CE, et al. Improving the care of youth with type 1 diabetes with a novel medical-legal community intervention: the Diabetes Community Care Ambassador Program. *Diabetes Educ* 2018;44:168–177
- Wagner DV, Barry SA, Stoeckel M, Teplitsky L, Harris MA. NICH at its best for diabetes at its worst: texting teens and their caregivers for better outcomes. *J Diabetes Sci Technol* 2017;11:468–475
- Sequeira PA, Montoya L, Ruelas V, et al. Continuous glucose monitoring pilot in low-income type 1 diabetes patients. *Diabetes Technol Ther* 2013;15:855–858
- Orrange S, Ruelas V, Peters AL. Specialized technology education for pumps and pens in underserved populations with diabetes. *Diabetes Technol Ther* 2022;24:268–275
- Bouchonville MF, Paul MM, Billings J, Kirk JB, Arora S. Taking telemedicine to the next level in diabetes population management: a review of the Endo ECHO model. *Curr Diab Rep* 2016;16:96
- Blecker S, Lemieux E, Paul MM, et al. Impact of a primary care provider tele-mentoring and community health worker intervention on utilization in Medicaid patients with diabetes. *Endocr Pract* 2020;26:1070–1076
- Romeo GR, Hirsch IB, Lash RW, Gabbay RA. Trends in the endocrinology fellowship recruitment: reasons for concern and possible interventions. *J Clin Endocrinol Metab* 2020;105:1701–1706
- Walker AF, Cuttriss N, Haller MJ, et al. Democratizing type 1 diabetes specialty care in the primary care setting to reduce health disparities: project extension for community healthcare outcomes (ECHO) T1D. *BMJ Open Diabetes Res Care* 2021;9:e002262
- Hernández-Muñoz JJ, De Santiago AC, Cedrone SZ, Verduzco RA, Bazan DZ. Impact of pharmacist-led drug therapy management services on HbA1c values in a predominantly Hispanic population visiting an outpatient endocrinology clinic. *J Pharm Pract* 2021;34:857–863
- Blanks SH, Treadwell H, Bazzell A, et al. Community engaged lifestyle modification research: engaging diabetic and prediabetic African American women in community-based interventions. *J Obes* 2016;2016:3609289

29. Kitzman H, Mamun A, Dodgen L, et al. Better Me Within randomized trial: faith-based diabetes prevention program for weight loss in African American women. *Am J Health Promot* 2021;35:202–213
30. Sattin RW, Williams LB, Dias J, et al. Community trial of a faith-based lifestyle intervention to prevent diabetes among African-Americans. *J Community Health* 2016;41:87–96
31. Berkley-Patton J, Bowe Thompson C, Bauer AG, et al. A multilevel diabetes and CVD risk reduction intervention in African American churches: Project Faith Influencing Transformation (FIT) feasibility and outcomes. *J Racial Ethn Health Disparities* 2020;7:1160–1171
32. Samuel-Hodge CD, Keyserling TC, France R, et al. A church-based diabetes self-management education program for African Americans with type 2 diabetes. *Prev Chronic Dis* 2006;3:A93
33. Philis-Tsimikas A, Fortmann A, Llevo-Ocana L, Walker C, Gallo LC. Peer-led diabetes education programs in high-risk Mexican Americans improve glycemic control compared with standard approaches: a Project Dulce *promotora* randomized trial. *Diabetes Care* 2011;34:1926–1931
34. Brown SA, Hanis CL. Lessons learned from 20 years of diabetes self-management research with Mexican Americans in Starr County, Texas. *Diabetes Educ* 2014;40:476–487
35. Hirko KA, Kerver JM, Ford S, et al. Telehealth in response to the COVID-19 pandemic: implications for rural health disparities. *J Am Med Inform Assoc* 2020;27:1816–1818
36. Lam K, Lu AD, Shi Y, Covinsky KE. Assessing telemedicine unreadiness among older adults in the United States during the COVID-19 pandemic. *JAMA Intern Med* 2020;180:1389–1391
37. Trief PM, Izquierdo R, Eimicke JP, et al. Adherence to diabetes self care for White, African-American and Hispanic American telemedicine participants: 5 year results from the IDEATel project. *Ethn Health* 2013;18:83–96
38. Raymond JK, Berget CL, Driscoll KA, Ketchum K, Cain C, Fred Thomas JF. CoYoT1 Clinic: innovative telemedicine care model for young adults with type 1 diabetes. *Diabetes Technol Ther* 2016;18:385–390
39. Reid MW, Krishnan S, Berget C, et al. CoYoT1 Clinic: home telemedicine increases young adult engagement in diabetes care. *Diabetes Technol Ther* 2018;20:370–379
40. Bakhach M, Reid MW, Pyatak EA, et al. Home telemedicine (CoYoT1 Clinic): a novel approach to improve psychosocial outcomes in young adults with diabetes. *Diabetes Educ* 2019;45:420–430
41. Crossen SS, Marcin JP, Qi L, et al. Home visits for children and adolescents with uncontrolled type 1 diabetes. *Diabetes Technol Ther* 2020;22:34–41
42. March CA, Muzumdar R, Libman I. How do virtual visits compare? Parent satisfaction with pediatric diabetes telehealth during the COVID-19 pandemic. *Front Clin Diabetes Healthc* 2022;2:794493
43. Eiland LA, Drincic A. Rural telehealth visits in the management of type 1 diabetes. *J Diabetes Sci Technol*. Online ahead of print on 12 October 2021 (doi: 10.1177/19322968211037990)
44. Anderson A, O'Connell SS, Thomas C, Chimmanamada R. Telehealth interventions to improve diabetes management among Black and Hispanic patients: a systematic review and meta-analysis. *J Racial Ethn Health Disparities*. Online ahead of print on 9 January 2022 (doi:10.1007/S40615-021-01174-6)
45. Vaughan EM, Johnson E, Naik AD, et al. Long-term effectiveness of the TIME intervention to improve diabetes outcomes in low-income settings: a 2-year follow-up. *J Gen Intern Med*. Online ahead of print on 7 February 2022 (doi:10.1007/s11606-021-07363-7)
46. Substance Abuse Mental Health Services Administration (SAMSHA). Shared decision-making helps pinpoint treatment options. Available from <https://www.samhsa.gov/homelessness-programs-resources/hpr-resources/shared-decision-making>. Accessed 14 January 2022
47. Tamhane S, Rodriguez-Gutierrez R, Hargraves I, Montori VM. Shared decision-making in diabetes care. *Curr Diab Rep* 2015;15:112
48. Institute of Medicine (US) Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, D.C., National Academies Press, 2001
49. Salvy SJ, Ruelas V, Majidi S, et al. Team Clinic: expansion of a multidisciplinary care model for adolescents with type 1 diabetes. *Contemp Clin Trials* 2020;95:106079
50. Raymond JK, Reid MW, Fox S, et al. Adapting home telehealth group appointment model (CoYoT1 clinic) for a low SES, publicly insured, minority young adult population with type 1 diabetes. *Contemp Clin Trials* 2020;88:105896
51. Montefiore. Supporting Emerging Adults with Diabetes (SEAD) program. Available from <https://www.montefiore.org/sead>. Accessed 3 March 2022
52. Philis-Tsimikas A, Walker C, Rivard L, et al.; Project Dulce. Improvement in diabetes care of underinsured patients enrolled in Project Dulce: a community-based, culturally appropriate, nurse case management and peer education diabetes care model. *Diabetes Care* 2004;27:110–115
53. Pascual AB, Pyle L, Nieto J, Klingensmith GJ, Gonzalez AG. Novel, culturally sensitive, shared medical appointment model for Hispanic pediatric type 1 diabetes patients. *Pediatr Diabetes* 2019;20:468–473
54. Céspedes-Knadle YM, Muñoz CE. Development of a group intervention for teens with type 1 diabetes. *The Journal for Specialists in Group Work* 2011;36:278–295
55. Munoz CE, Hsin O, Gamez SH, Raymond J, Fisher LK. Self-efficacy and mood in youths with T1D before and after a curriculum-based group intervention [Abstract]. *Diabetes* 2020;69(Suppl. 1):15-OR
56. Fantasia KL, Wirunsawanya K, Lee C, Rizo I. Racial disparities in diabetes technology use and outcomes in type 1 diabetes in a safety-net hospital. *J Diabetes Sci Technol* 2021;15:1010–1017
57. Addala A, Hanes S, Naranjo D, Maahs DM, Hood KK. Provider implicit bias impacts pediatric type 1 diabetes technology recommendations in the United States: findings from the Gatekeeper Study. *J Diabetes Sci Technol* 2021;15:1027–1033
58. FitzGerald C, Hurst S. Implicit bias in healthcare professionals: a systematic review. *BMC Med Ethics* 2017;18:19
59. Gonzalez CM, Kim MY, Marantz PR. Implicit bias and its relation to health disparities: a teaching program and survey of medical students. *Teach Learn Med* 2014;26:64–71
60. Chapman MV, Hall WJ, Lee K, et al. Making a difference in medical trainees' attitudes toward Latino patients: a pilot study of an intervention to modify implicit and explicit attitudes. *Soc Sci Med* 2018;199:202–208
61. Wang C, Burris MA. Photovoice: concept, methodology, and use for participatory needs assessment. *Health Educ Behav* 1997;24:369–387
62. Lipman TH, Smith JA, Patil O, Willi SM, Hawkes CP. Racial disparities in treatment and outcomes of children with type 1 diabetes. *Pediatr Diabetes* 2021;22:241–248
63. Lai CW, Lipman TH, Willi SM, Hawkes CP. Racial and ethnic disparities in rates of continuous glucose monitor initiation and

- continued use in children with type 1 diabetes. *Diabetes Care* 2021;44:255–257
64. Lai CW, Lipman TH, Willi SM, Hawkes CP. Early racial/ethnic disparities in continuous glucose monitor use in pediatric type 1 diabetes. *Diabetes Technol Ther* 2021;23:763–767
 65. Lipman TH, Willi SM, Lai CW, Smith JA, Patil O, Hawkes CP. Insulin pump use in children with type 1 diabetes: over a decade of disparities. *J Pediatr Nurs* 2020;55:110–115
 66. Agarwal S, Kanapka LG, Raymond JK, et al. Racial-ethnic inequity in young adults with type 1 diabetes. *J Clin Endocrinol Metab* 2020;105:E2960–E2969
 67. Agarwal S, Schechter C, Gonzalez J, Long JA. Racial-ethnic disparities in diabetes technology use among young adults with type 1 diabetes. *Diabetes Technol Ther* 2021;23:306–313
 68. Magee MF, Baker KM, Fernandez SJ, et al. Redesigning ambulatory care management for uncontrolled type 2 diabetes: a prospective cohort study of the impact of a boot camp model on outcomes. *BMJ Open Diabetes Res Care* 2019;7:e000731
 69. Munshi M, Slyne C, Davis D, et al. Use of technology in older adults with type 1 diabetes: clinical characteristics and glycemic metrics. *Diabetes Technol Ther* 2022;24:1–9
 70. Pratley RE, Kanapka LG, Rickels MR, et al.; Wireless Innovation for Seniors With Diabetes Mellitus (WISDM) Study Group. Effect of continuous glucose monitoring on hypoglycemia in older adults with type 1 diabetes: a randomized clinical trial. *JAMA* 2020;323:2397–2406
 71. Centers for Medicare & Medicaid Services. National coverage analysis—insulin pump: C-peptide levels as a criterion for use (CAG-00092R): decision memo. Available from <https://www.cms.gov/medicare-coverage-database/view/nca.aspx?ncid=109&bc=0>. Accessed 14 January 2022
 72. Argento NB, Liu J, Hughes AS, McAuliffe-Fogarty AH. Impact of Medicare continuous subcutaneous insulin infusion policies in patients with type 1 diabetes. *J Diabetes Sci Technol* 2020;14:257–261
 73. Walker RJ, Strom Williams J, Egede LE. Influence of race, ethnicity and social determinants of health on diabetes outcomes. *Am J Med Sci* 2016;351:366–373
 74. Shi Q, Zhao Y, Fonseca V, Krousel-Wood M, Shi L. Racial disparity of eye examinations among the U.S. working-age population with diabetes: 2002–2009. *Diabetes Care* 2014;37:1321–1328
 75. Ilkowitz JT, Choi S, Rinke ML, Vandervoot K, Heptulla RA. Pediatric type 1 diabetes: reducing admission rates for diabetes ketoacidosis. *Qual Manag Health Care* 2016;25:231–237
 76. Schwartz DD, Vakharia M, Uysal S, et al. A comprehensive system for identifying patients with type 1 diabetes at increased risk for diabetic ketoacidosis at Texas Children's Hospital. *Clin Diabetes* 2022;40:92–96
 77. Park DW, Mansberger SL. Eye disease in patients with diabetes screened with telemedicine. *Telemed J E Health* 2017;23:113–118
 78. Jani PD, Forbes L, Choudhury A, Preisser JS, Viera AJ, Garg S. Evaluation of diabetic retinal screening and factors for ophthalmology referral in a telemedicine network. *JAMA Ophthalmol* 2017;135:706–714
 79. Benjamin JE, Sun J, Cohen D, et al. A 15 month experience with a primary care-based telemedicine screening program for diabetic retinopathy. *BMC Ophthalmol* 2021;21:70
 80. Anderson RM, Musch DC, Nwankwo RB, et al. Personalized follow-up increases return rate at urban eye disease screening clinics for African Americans with diabetes: results of a randomized trial. *Ethn Dis* 2003;13:40–46
 81. Rastas C, Bunker D, Gampa V, et al. Association between high deductible health plans and cost-related non-adherence to medications among Americans with diabetes: an observational study. *J Gen Intern Med*. Online ahead of print on 29 July 2021 (doi:10.1007/S11606-021-06937-9)
 82. Bailey GR, Barner JC, Weems JK, et al. Assessing barriers to medication adherence in underserved patients with diabetes in Texas. *Diabetes Educ* 2012;38:271–279
 83. Herkert D, Vijayakumar P, Luo J, et al. Cost-related insulin underuse among patients with diabetes. *JAMA Intern Med* 2019;179:112–114
 84. Dine CJ, Masi D, Smith CD. Tools to help overcome barriers to cost-of-care conversations. *Ann Intern Med* 2019;170(Suppl. 9):S36–S38
 85. Reichert S, Simon T, Halm EA. Physicians' attitudes about prescribing and knowledge of the costs of common medications. *Arch Intern Med* 2000;160:2799–2803
 86. Heisler M, Wagner TH, Piette JD. Clinician identification of chronically ill patients who have problems paying for prescription medications. *Am J Med* 2004;116:753–758
 87. Haider S, El Kawkgi O, Clark J, et al. Beyond hemoglobin A1c: a videographic analysis of conversations about quality of life and treatment burden during clinical encounters for diabetes care. *Endocrine* 2021;73:573–579
 88. American College of Physicians. Healthcare transparency: talking to patients about the cost of their health care. Available from <https://www.acponline.org/clinical-information/high-value-care/resources-for-clinicians/cost-of-care-conversations>. Accessed 3 March 2022
 89. American College of Physicians. Short list of best resources for patients. Available from https://www.acponline.org/system/files/documents/clinical_information/high_value_care/clinician_resources/cost-of-care/8-cost-of-care-patient-resources_.pdf. Accessed 4 March 2022
 90. Busell JK, Cha E, Grant YE, Schwartz DD, Young LA. Ways health care providers can promote better medication adherence. *Clin Diabetes* 2017;35:171–177
 91. Kang H, Lobo JM, Kim S, Sohn MW. Cost-related medication non-adherence among U.S. adults with diabetes. *Diabetes Res Clin Pract* 2018;143:24–33
 92. Luo J, Feldman R, Rothenberger S, Korytkowski M, Fischer MA, Gellad WF. Incidence and predictors of primary nonadherence to sodium glucose co-transporter 2 inhibitors and glucagon-like peptide 1 agonists in a large integrated healthcare system. *J Gen Intern Med*. Online ahead of print on 19 January 2022 (doi:10.1007/S11606-021-07331-1)
 93. Steve Tsang CC, Browning J, Todor L, et al. Factors associated with medication nonadherence among Medicare low-income subsidy beneficiaries with diabetes, hypertension, and/or heart failure. *J Manag Care Spec Pharm* 2021;27:971–981
 94. Cummings DM, Lutes LD, Littlewood K, Solar C, Hambidge B, Gatlin P. Impact of distress reduction on behavioral correlates and A1C in African American women with uncontrolled type 2 diabetes: results from EMPOWER. *Ethn Dis* 2017;27:155–160