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Telehealth Interventions to Improve Diabetes Management Among Black and Hispanic Patients: a Systematic Review and Meta-Analysis

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Abstract

Background Previous systematic reviews have found that telehealth is an effective strategy for implementing interventions to improve glycemic control and other clinical outcomes for diabetes patients. However, these reviews have not meaningfully focused on Black and Hispanic patients—partly because of the lack of adequate representation of people from racial and ethnic minority groups in clinical trials. It is unclear whether telehealth interventions are effective at improving glycemic control among Black and Hispanic patients given the disproportionate number of barriers they face accessing health care.

Objectives A systematic review and meta-analysis of randomized control trials that used telehealth interventions for improving glycemic control among Black and Hispanic diabetes patients.

Methods We reviewed PubMed, Embase, Web of Science, CINAHL, PsycINFO, and clinicalTrials.gov from inception to March 2021. We used a narrative summary approach to describe key study characteristics and graded the quality of studies using two reviewers. The pooled net change in HbA1c values was estimated across studies using a random-effects model.

Results We identified 10 studies that met our inclusion and exclusion criteria. Nine studies were included in the meta-analysis. Only one study was rated as having low bias. Telehealth interventions were primarily delivered by telephone calls, text messages, web-based portals, and virtual visits. Most interventions involved delivering diabetes self-management education. Telehealth intervention pooled across studies with a mix of Black and Hispanic participants (> 50% sample) was associated with a -0.465 ([CI: -0.648 to -0.282], $p=0.000$) reduction in HbA1c.

Conclusions Our findings suggest telehealth interventions are effective at improving glycemic control among Black and Hispanic diabetes patients.

Keywords Telehealth · Telemonitoring · Diabetes · Minority health · Healthcare disparities · Glycemic control

Introduction

The use of telecommunication, digital, and virtual technologies that expand access and improve continuity of care has the potential to improve the treatment and self-management of diabetes, particularly for Black and Hispanic patients. Black and Hispanic diabetes patients have worse outcomes and are more likely to be at risk for amputations, chronic kidney disease, and death compared to White patients [1]. These negative outcomes can be mediated by sustained glycemic control (i.e., HbA1c 7.0–8.5%) and timely access to primary care [2]. However, Black and Hispanic patients face greater barriers to accessing traditional, in-person health care. For instance, patients from racial and ethnic minority groups disproportionately experience transportation barriers resulting in missed appointments, delayed care, and lower medication use [3–5]. They are also less likely to have primary care near their communities compared to White patients (Arnett et al., 2016; Shi et al., 2014). These barriers are attributed to structural racism which is a basic cause of racial inequities in health care [6–8]. Telehealth has demonstrated effectiveness in reducing these barriers by decreasing the need to travel, the need to take off time from work for a doctor's appointment, the length of time to see a provider, as well as providing easier access to interpreters for people with limited English proficiency [9].

Expanding access to telehealth has been recommended as a key strategy for reducing racial disparities in diabetes outcomes [10]. Telehealth can be used for improving

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education, prompting medication adherence, monitoring of vitals, and the application of direct treatments [11]. Yet, patients from racial and ethnic minority groups face barriers in accessing telehealth [12, 13]. Black and Hispanic patients are consistently less likely to have access to the Internet which is necessary for various modes of telehealth [14]. Also, patients with limited English proficiency are less likely to use telehealth compared to proficient English speakers [13]. A recent analysis of 7742 family medicine encounters preceding the Covid-19 pandemic found the likelihood of a telehealth visit was consistently lower for Black and Hispanic patients [15]. A study in a large health system in New York City found White patients were more likely to use telehealth, and Black and Hispanic patients were more likely to have office-based and emergency room visits during the pandemic [16]. Another study during the pandemic, at a large, urban tertiary care center in the Midwest, found Black patients were less likely to complete a scheduled telehealth visit [17].

Various telehealth interventions have demonstrated effectiveness in improving glycemic control among people living with diabetes. Telehealth interventions that are used for routine evaluation and management of chronic diseases include web-based lifestyle interventions, telemonitoring, mobile messaging, telephone interventions, and many others [18]. Telehealth can facilitate remote treatment, continuous monitoring, and support for self-care, which can improve diabetes management. One meta-analysis of four systematic reviews found telehealth interventions produce a significant improvement in diabetes control, with the greatest effect for telephone-delivered interventions and internet-based blood glucose monitoring programs [19]. Another review of over 100 randomized control trials found telehealth is effective for glycemic control and other clinical outcomes and promotes better control over time compared to usual care [20]. However, these reviews have not meaningfully focused on patients from Black and Hispanic communities or empirically synthesized the findings across studies—partly because of the lack of representation of these patients in clinical trials. One systematic review of telehealth clinical trials for type 2 diabetes found less than 25% of trials recruited a sizeable proportion (> 30%) of patients from racial and ethnic minority groups [21].

It is unclear whether telehealth interventions are effective at improving glycemic control among Black and Hispanic patients given the disproportionate number of barriers they face accessing health care, providing self-care, and accessing resources to engage in telehealth. The purpose of this systematic review and meta-analysis was to examine the existing literature for studies that have centered or substantively included Black and Hispanic diabetes patients in clinical trials to assess the effectiveness of telehealth interventions in improving glycemic control.

Conceptual Framework

Interventions for improving diabetes outcomes have been categorized by their target including patients, providers, and health systems or combination multi-target interventions [22]. Conceptually, telehealth strengthens the connections between clinicians and other clinicians, between patients and their clinicians, and patients to other patients (e.g., peer support groups) [23]. Therefore, interventions can operate at multiple levels of the health care system to improve diabetes outcomes. Patients have a role in self-care (e.g., self-monitoring, variation of nutrition daily needs, insulin adjustments, and exercise) which is essential for sustained glycemic control [24]. Providers have a role in diagnosis, treatment, education, and coordination of care. Health care organizations and systems influence the overall structures of care (e.g., ensuring access to interpreters) and processes of care (e.g., proper routine screening to identify people at risk for diabetes or loss of control) that influence patient outcomes. Therefore, we categorized telehealth interventions based on the intended target for improving glycemic control [25].

Methodology

Data Sources

We reviewed PubMed, Embase, Web of Science, CINAHL, PsycINFO, and clinicalTrials.gov from inception to March 2021. Information sources were searched using the following Medical Subject Headings (MeSH) and keywords appropriate to each database: “Diabetes Mellitus,” “type 2 diabetes,” “Ethnic Groups,” “African American,” “Black,” “Hispanic,” “Latino,” “Latina,” “Latinx,” “health inequality,” and “health disparities.” Databases were not limited by date, language, or publication status. In addition to database searching, reference lists of relevant review articles were manually searched to identify trials on the topics of telehealth and HbA1c improvement in racial and ethnic minority groups. To review the full search strategy, see the Supplemental Appendix. This systematic review was conducted following PRISMA guidelines.

Eligibility Criteria

We reviewed randomized controlled trials evaluating the effectiveness of telehealth interventions aimed at improving HbA1c values (i.e., glycemic control) among Black and Hispanic patients with type 2 diabetes connected to primary care. We defined telehealth as the delivery of health care, health education, and health information services by remote technologies [26]. We used the following inclusion criteria: telehealth interventions connected to primary care settings aimed at improving glycemic control (e.g., promotion of physical activity, nutritional/dietary education, glycemic self-monitoring, and remote outpatient visits); the sample included a majority of minority patients, Black and/or Hispanic; and reported HbA1c values as a primary or secondary outcome of the intervention. We excluded international studies because of the unique racial context in the USA. Studies were also excluded for the following reasons: telehealth was not the intervention, the sample included over 50% non-Hispanic white patients, and HbA1c values were not reported at baseline and post-intervention, publication type other than peer-reviewed primary research such as literature reviews, conference abstracts, or dissertations. To be included in the meta-analysis, studies were required to report the net change in HbA1c values and the standard error of the net change in HbA1c values, or information to calculate these values. Studies were excluded from meta-analysis if insufficient information was available.

Study Identification

Each study was screened independently and in duplicate by two reviewers using Covidence software. Titles and abstracts were screened using prespecified eligibility criteria. Those that appeared to meet eligibility criteria moved to full-text review. Full-text articles were further assessed for eligibility by two reviewers, independently and in duplicate. Articles that did not meet the prespecified eligibility criteria were excluded from the review. All discrepancies were resolved by a third reviewer.

Data Extraction

Two reviewers independently abstracted data from each report using Qualtrics survey software. Data items were abstracted using a standardized abstraction form, modified from the Cochrane Collaboration [27]. Once data items were abstracted, all information was synthesized in Excel. Any discrepancies were resolved by a third reviewer. The following information was abstracted from each study: citation information (e.g., study author and year of publication), study methods (e.g., study design and duration of participation), participant characteristics (e.g., population description, setting from which participants were drawn, mean age, number of female and male participants, number of participants in each racial/ethnic minority group, education level, income, and baseline HbA1c values), intervention characteristics (e.g., number randomized to the intervention group, description of the intervention, duration of the treatment period, frequency of intervention delivery, mode of telehealth, and setting), comparison group characteristics (e.g., type of comparison group, number randomized to the group, description, duration of the control period, and providers), and HbA1c values at baseline and post-intervention.

Quality Assessment

The risk of bias within each study was assessed using the Cochrane Collaboration's tool for assessing risk of bias in randomized controlled trials [28]. Each study was assessed for selection bias, performance bias, reporting bias, and attrition bias by two independent reviewers. For each domain of bias, levels of bias were rated as high, low, or unclear. The approach recommended by the Cochrane Collaboration was used to generate the overall risk of bias for each study. If a study was judged to have low risk of bias for all domains, the overall risk of bias was categorized as low. If a study was judged to have low or unclear risk of bias for all domains, the overall risk of bias was categorized as unclear. Finally, if a study was judged to have a high risk of bias for at least one domain, the overall risk of bias was categorized as high.

Outcome Measures

For each study, we identified or calculated the net change in HbA1c. All studies included in the meta-analysis were parallel trials. Therefore, we calculated the net change of the telehealth intervention on HbA1c values by subtracting mean change (from baseline to post-intervention) in the telehealth group from the mean change in the control group. We obtained post-intervention HbA1c values from the final follow-up period of the study.

Data Synthesis and Analysis

We used a narrative summary approach to describe key study characteristics (e.g., intensity and duration of telehealth intervention). We mapped studies based on the type of intervention to the conceptual framework developed by Chin et al. [22]. For studies included in meta-analysis, we extracted the baseline and post-intervention HbA1c values and measures of variance from each study. The net change was weighted for each trial by the inverse of its variance. If a trial's variance was not reported, it was calculated based on standard deviations, confidence intervals, or p values. Q and I^2 statistics were used to assess heterogeneity of effect sizes. The pooled net change and confidence interval were calculated using the Dersimonian and Laird random-effects model [29]. A forest plot was produced to visually assess the net change and corresponding 95% confidence intervals across studies. A funnel plot, using the trim and fill method, and the Egger test were used to assess publication bias. Unless otherwise stated, $p < 0.05$ was considered statistically significant, and all tests were two-sided. All syntheses were computed using Stata statistical software version 17.0 (StataCorp, College Station, Texas).

Subgroup and Sensitivity Analyses

We conducted a subgroup analysis according to the race/ethnicity of study participants in each trial, whether the study had a focus or substantial representation (> 50% sample) of Black patients (Black or Black and Hispanic) or only Hispanic patients. To test whether our pre-selected criteria for representation of Black and Hispanic patients impacted our primary outcome, the net change in HbA1c, we conducted a sensitivity analysis excluding studies with any non-Hispanic White participants and found similar results. In addition, we conducted subgroup analyses according to study quality and intervention level. Study quality was divided into three groups: comparing low, unclear, or high risk of bias studies. Intervention level compared patient-level interventions to multifaceted interventions addressing community and patient-level factors. To assess the robustness of our findings, we examined whether racial or intervention level factors influenced our overall pooled effect estimate.

Results

Study Selection

We identified 255 studies of possible relevance. We found 10 randomized control trials that met our predefined inclusion and exclusion criteria. Figure 1 shows the results of the search strategy. Most of the final studies deemed potentially relevant did not meet our definition of telehealth, did not include a representative sample of Black and/or Hispanic patients, or did not test their interventions in the context of a randomized controlled trial. Many studies met multiple criteria for exclusion but were only tagged with one exclusion criterion.

Summary of Systematic Review Findings

All interventions in our final sample of studies reported significant improvements in glycemic control among Black and Hispanic patients during the intervention period. The average duration of interventions, was 9 months, and the studies varied in the intensity of contact with participants from daily, weekly, to monthly—depending on the intervention modality. Telehealth interventions were primarily delivered by telephone calls [30–33], text messages [31, 34], web-based portals [33, 35], and virtual visits [36]. Patient-level only interventions primarily involved delivering diabetes self-management education (DSME) [30, 31, 34–36]. One patient-level intervention involved the use of remote monitoring devices assessing blood pressure control and blood glucose levels, pared with counseling and lifestyle recommendations specific to the patient [37]. Another intervention coupled DSME with a digital decision aid to help patients manage their goals [32]. Interventions often employed multiple implementation strategies (e.g., phone calls, text messages, and virtual counseling) instead of only one strategy. Only two studies used multi-target interventions as defined by our conceptual framework [33, 38]. Both multi-target interventions focused on improving the capacity and capability of community health workers through training

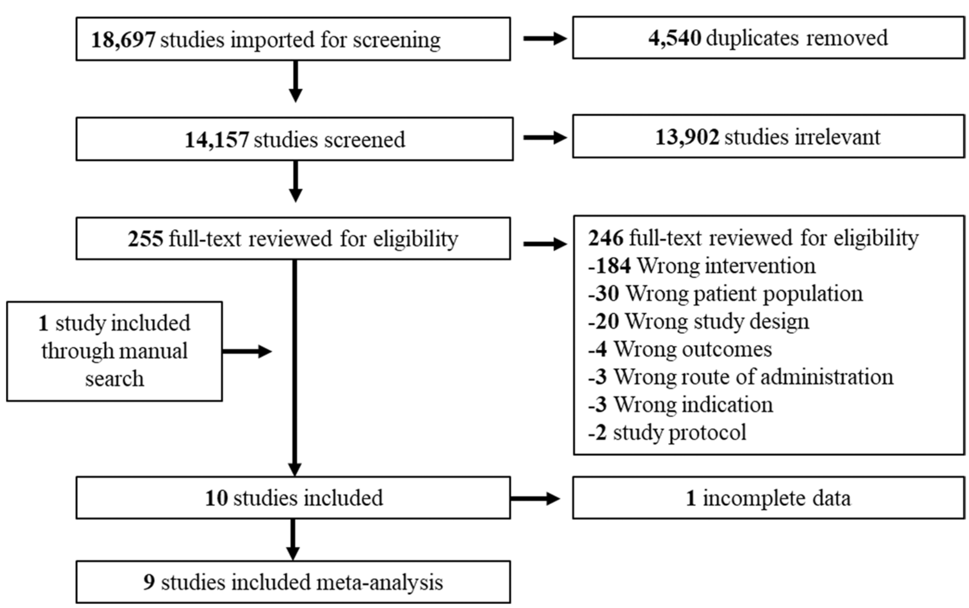

Fig. 1 Study selection and exclusion

Table.1 Characteristics of included studies

Study	Intervention	*n*, Follow-up, racial/ethnic composition	Setting	Patient outcomes	Summary	Risk of bias
[36]	I: Participants received DSME with three group sessions conducted by interactive videoconferencing by a self-management education team C: Routine care	I: 64 B/AA and 21 W C: 58 B/AA and 22 W 13 sessions over 12 months	Federally qualified health center	I: − 1.1% HbA1c C: − 0.3% HbBA1c	Telehealth increased access to DSME which resulted in improved glycemic control	RG: Low AC: High RB: Unclear PB: High AB: Low[
[34]	I: Participants received two to three DMSE text messages delivered through a mobile device C: Routine care	I: 63 L/H C: 63 L/H 6 months	Federally qualified health center	I: − 1.0% HbA1c C: − 0.2% HbA1c	Hispanic patients had greater improvement in glycemic control	RG: Low AC: High RB: Low PB: High AB: Low
[35]	I: Participants received online diabetes self-management that integrates provider-patient communication with patient self-management and health education C: Routine care	I: 26 B/AA C: 21 B/AA Bi-weekly	Primary care practice	I: − 2.18% HbA1c C: − 0.9% HbA1c	Telehealth may promote effective chronic disease management among African Americans	RG: Low AC: Unclear RB: Low PB: High AB: Unclear
[54]	I: Participants received personally tailored diabetes education, lifestyle, and management support groups and referrals to psychosocial services via an internet-based platform C: Routine care	I: 199 LX C: 200 LX 2 weeks, 1 month, 3 months, and 6 months post enrollment	Federally qualified health center	I: − 0.5% hBa1C C: − 0.2% HbA1c	The diabetes dashboard significantly improved glycemic control among Latinos with poorly controlled T2D	RG: Low AC: Low RB: Low PB: Unclear AB: Low
[32]	I: Participants received an individually tailored, interactive web-based tool (iDecide) that described general risk, participants' own risk, reviews of current medications, and prompts to set goals with peer coaches C: Routine care and peer coaches only	I: 92 B/AA and 55 53 W C: 89 B/AA, 53 W, and 2 L/H	Primary care setting	I: − 0.56% HbA1c C: − 0.55% HbA1c	Clinical gains achieved through a volunteer peer coach program were not increased by the addition of the telehealth intervention	RG: Low AC: High RB: Low PB: Low AB: Low

Table.1 (continued)

Study	Intervention	*n*, Follow-up, racial/ethnic composition	Setting	Patient outcomes	Summary	Risk of bias
[31]	I: Participants received three types of automated text messages: self-care promotion one-way texts, interactive texts that asked them about medication adherence, and adherence feedback texts that provided weekly feedback and encouragement based on responses to the interactive texts on patients' mobile devices C: Routine care	I: 99 B/AA, 16 L/H, 121 W C: 99 B/AA, L/H 15, 16 Other, 121 W	Community health centers	Significant treatment effects were found at 3 months (I: -0.26%) and 6 months (I: -0.31%) but not at 12 and 15 months (post intervention period)	The text message intervention improved short-term HbA1c control. Texts alone may not be sufficient to sustain the effects	RG: Low AC: Low RB: Low PB: Low AB: Low
[38]	I: Participants received weekly calls and texts from community health workers through a mobile device along with in-person peer-led group visits, large group education, small group discussions, and were provided a healthy meal C: Routine care	I: 44 L/H C: 45 L/H 6 months	Non-profit clinic	I: – 1.43% HbA1c C: – 0.45% HbA1c	The telehealth portion of the intervention supported integrated care and led to better HbA1c control	RG: Low AC: Unclear RB: Unclear PB: High AB: Unclear
[38]	I: Participants received weekly calls and texts from community health workers through a mobile device along with in-person peer-led group visits, large group education, small group discussions, and were provided a healthy meal C: Routine care	I: 44 L/H C: 45 L/H 6 months	Non-profit clinic	I: – 1.43% HbA1c C: – 0.45% HbA1c	The telehealth portion of the intervention supported integrated care and led to better HbA1c control	RG: Low AC: Unclear RB: Unclear PB: High AB: Unclear
[33]	I: Participants received DSME plus mobile health (mHealth)–enhanced peer support intervention C: Enhanced routine care	I: 67 B/AA C: 35 B/AA 6 months	Diabetes clinic	I: -1.0% HbA1c C:-0.7% HbA1c	Participants in intervention and control groups experienced clinically meaningful	RG: Low AC: Unclear RB: High PB: High AB: Low
[37]	I: Participants received remote blood pressure monitoring devices, scales, and pulse oximeters as well as a monthly call (medications, diet, and lifestyle) and tailored recommendations C: Routine care	I: 8 B/AA and 1 L/H C: 9 B/AA and 4 L/H 3 months	Primary care practice	I: – 2.77% HbA1c C: – 2.07% HbA1c	Augmenting routine care with telehealth provided by telephone or tablet can improve glycemic control	RG: Low AC: Unclear RB: Unclear PB: High AB: High

Table.1 (continued)

Study	Intervention	*n*, Follow-up, racial/ethnic composition	Setting	Patient outcomes	Summary	Risk of bias
[30]	I: Participants received phone calls from health educators participants that delivered DSME using theory-based approaches for promoting behavioral changes to improve diabetes control C: Mailed print diabetes self-management materials at baseline and modest lifestyle incentives quarterly	I: 293 L/H, 132 B/AA, and 4 W C: 344 L/H, 121 B/AA, and 4 W 12 months	Clinical registry	I: −0.9% HbA1c C: −0.5% HbA1c	Telephone interventions delivered by health educators can be effective in improving diabetes control	RG: Unclear AC: Low RB: Unclear PB: Low AB: Low

I, intervention; *C*, control; *B/AA*, Black and/or African American; Latinx/Hispanic; *W*, white; *DSME*, Diabetes Self-Management Education

Random sequence generation (RG)—described the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups

Allocation concealment (AC)—described the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen before or during enrollment

Reporting bias (RB)—stated how the possibility of selective outcome reporting was examined by the authors and what was found

Performance bias (PB)—described all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provided any information relating to whether the intended blinding was effective

Attrition bias (AB)—incomplete outcome data—described the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. Stated whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions were reported and tools while simultaneously improving access to care for patients [33, 38] (Table 1).

Results of Meta-Analysis

Nine studies were included in the meta-analysis. One study was excluded due to missing information on the variance of the net change in HbA1c values [32]. The pooled net change in HbA1c is presented in Fig. 2. The Q test and I^2 statistics indicated insignificant heterogeneity ($I^2 = 0.0\%$, $p = 0.438$). Although there was insignificant heterogeneity, the DerSimonian and Laird random-effects model was used to improve the generalizability of our findings. The z value of the test ES = 0 was − 4.972, $p = 0.000$. Therefore, the estimation of the pooled effect size is significant. We conclude that compared to the control group, telehealth intervention was significantly associated with a − 0.465% (CI: − 0.648 to − 0.282) reduction in HbA1c compared to other forms of routine care.

Subgroup Analyses

The results of the subgroup analysis are displayed in Fig. 3. We used a random-effects model for all subgroup analyses. For studies including Black participants (both Black/Black and Hispanic), the pooled effect size was − 0.442 ([CI: − 0.653 to − 0.231], $p = 0.000$). For studies with only Hispanic participants, the pooled effect size was − 0.851 ([CI: − 1.530 to − 0.173], $p = 0.014$). To assess differences based on study quality, subgroup analyses compared the pooled effect size between low risk, unclear risk, and high risk of bias studies. Only one study was considered to have a low risk of bias. The effect size for this study was − 0.310 ([CI: − 0.605 to − 0.015], $p = 0.039$). For studies where the risk of bias was unclear, the pooled effect size was − 0.538 ([CI: − 0.832 to − 0.245]), $p = 0.000$). For studies that were evaluated to have a high risk of bias, the pooled effect size was − 0.637 ([CI: − 1.096 to − 0.178], $p = 0.007$).

Differences in HbA1c reduction were compared between studies using a patient-level only versus multi-target interventions. The pooled effect size for patient-level only intervention studies was − 0.476 ([CI: − 0.664 to − 0.288], $p = 0.000$). For multi-target (i.e., patient and community-health workers interventions), the pooled effect size was − 0.329 ([CI: − 1.479–0.821], $p = 0.575$). We found the pooled effect size was significant for patient-level only telehealth interventions but not the two studies that used multi-target interventions.

To further assess the robustness of our findings, sensitivity analyses were conducted excluding studies with any white participants, that included only Hispanic participants, and those with multi-target interventions. The pooled effect size for studies that included Black and Hispanic diabetes patients exclusively was − 0.595 ([CI: − 1.170 to − 0.020], $p = 0.042$). Likewise, the pooled effect size for studies targeting Black or Black/Hispanic patients, but not Hispanic only, was − 0.442 ([CI: − 0.653 to − 0.231], $p = 0.000$). For patient-level intervention studies, the pooled effect size was also significant, with a value of − 0.476 ([CI: − 0.664 to − 0.288], $p = 0.000$) (See Supplemental Appendix).

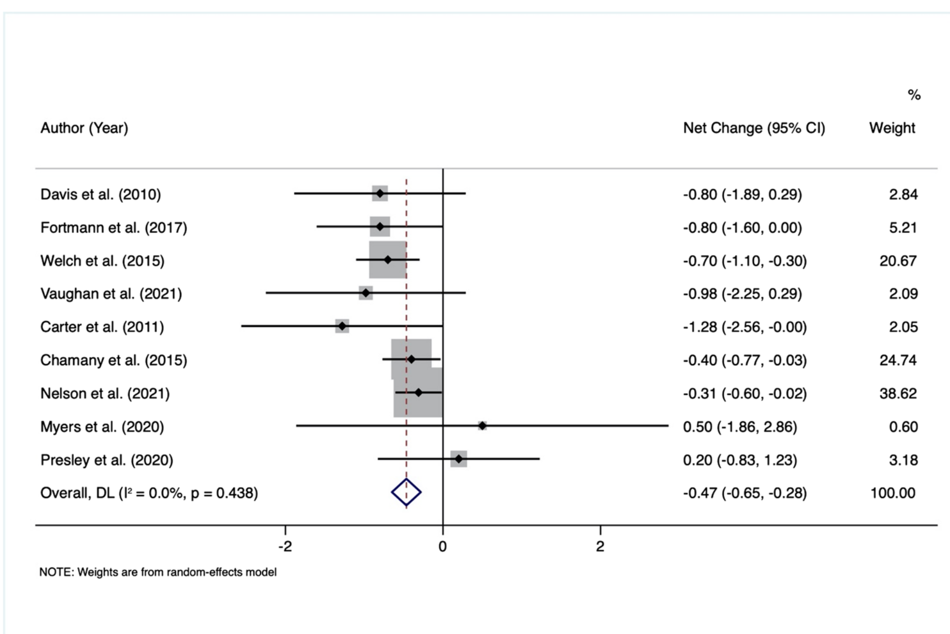

Fig. 2 Pooled net change in HbA1c in studies comparing telehealth intervention to control group. Net change of each study is depicted by each box; bars represent 95% CI. The pooled mean difference is indicated by the diamond

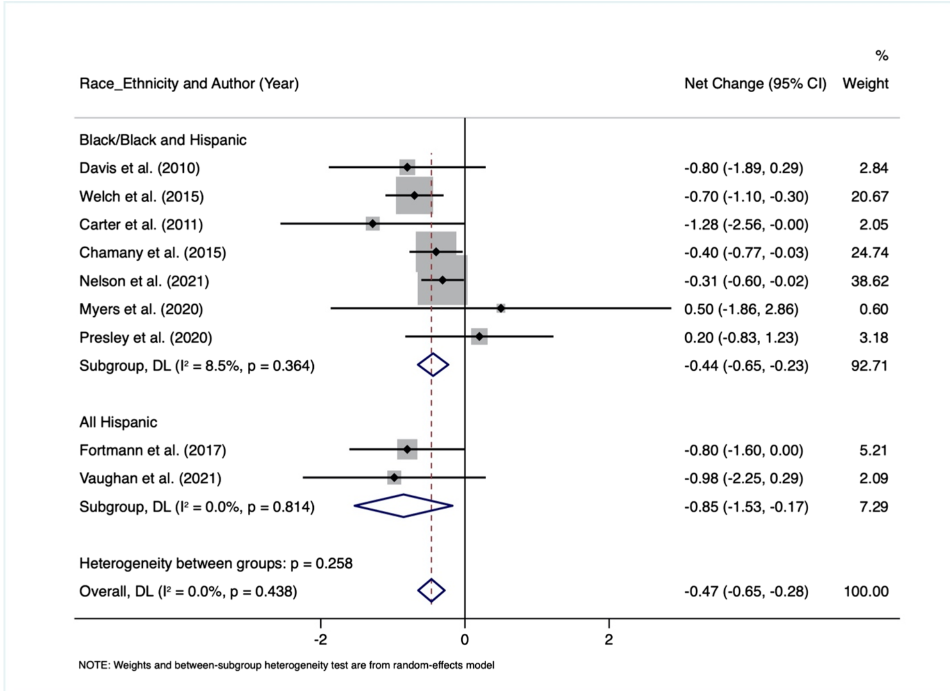

Fig. 3 Subgroup analysis of the reduction of HbA1c, based on race/ethnicity of participants

Publication Bias

For reduction in HbA1c, the funnel plot demonstrates that the distribution of the net change estimates for individual studies was approximately symmetrical around the pooled net change estimate for trials comparing telehealth to a control group, suggesting a lack of publication bias. The trim and fill method verified this lack of publication bias (See Supplemental Appendix). In addition, the Egger test detected non-significant bias with a *p* value 0.514.

Discussion

Our findings suggest telehealth interventions can be effective at improving glycemic control among Black and Hispanic diabetes patients. The findings are consistent with previous systematic reviews that found telehealth can improve glycemic control and other outcomes (e.g., medication adherence, goal achievement, and knowledge) through improved access to quality care (e.g., education, counseling, monitoring) [39–42]. This review, however, is the first to analyze the subset of studies that have focused on Black and Hispanic diabetes patients. Most studies were published between 2015 and 2020. We found a relatively small number of experimental studies with a focus or substantial representation of Black and/or Hispanic patients. We found even fewer that implemented multi-target interventions, and no studies that focused on improving systems of health care delivery to better facilitate access to telehealth to improve diabetes care for Black and Hispanic patients.

In addition to computing the overall pooled effect size of telehealth interventions on glycemic control, we computed the effect sizes for various subgroups to compare the effects of telehealth on HbA1c according to patient race, study quality, and targeted intervention level. The effect of telehealth was significant in studies that included Black and Hispanic, as well as exclusively Hispanic populations. While the effect of telehealth interventions was significant in both groups, only two studies only included Hispanic populations, and thus the effect estimate is less precise. In addition to comparing the effects according to patient race, we analyzed the effects of study quality. While most studies belonged to the high risk of bias group, they contributed the least weight to the overall pooled effect estimate. Studies that were categorized as unclear and low risk of bias contributed the most weight to our overall pooled effect estimate due, in part, to more precise estimates of the effects. In addition, all quality subgroups indicated a significant effect of telehealth interventions on HbA1c reduction. When looking at the effect of intervention target, only patient-level interventions indicated a significant reduction in HbA1c. Only two studies targeted provider and patient-level factors, both had large confidence intervals, suggesting imprecise estimates of the effect. Finally, when assessing the robustness of our findings, we found that our results remained significant when removing studies that included White participants, only Hispanic participants, or multi-target interventions.

Most studies used diabetes self-management education (DSME), that aims to improve knowledge and decision-making, as a primary intervention. DSME is an evidence-based strategy for improving glycemic control [43, 44]. The primary focus of DSME for glycemic control among Black and Hispanic patients implies that knowledge is a primary barrier to self-care. But it is unclear whether other barriers are more salient as studies rarely report an assessment of the barriers or specific behavioral issue their interventions aim to address. For example, Black and Hispanic patients are disproportionately less likely to have access to local healthy foods [45, 46] and may face barriers to consistently accessing insulin [47]. System-level telehealth interventions could involve information feedback loops that describe levels of food insecurity (i.e., food insecurity screened and if identified addressed), reimbursable digital tools for daily self-management, and low cost-sharing for treatment and prescription drugs. A spectrum of new digital connected services, machine learning, and advanced decision support tools will increasingly become available to support diabetes self-management [48]. These new technologies could be effective in addressing multiple barriers to glycemic control among Black and Hispanic patients.

Among the telehealth interventions that included multi-target strategies both targeted improving the effectiveness of community health workers—frontline health professionals who act as conduits between communities and health care providers. A recent meta-analysis of randomized control trials found community-health workers can be effective in helping patients improve glycemic control [50]. And studies have found telehealth interventions are feasible and acceptable for training community-health workers as well as enhancing their capacity to deliver glycemic control strategies like patient education and counseling [51–53]. Future work should assess the extent to which telehealth improves the effectiveness of community health workers in diabetes control interventions among racial and ethnic minorities.

The Covid-19 pandemic has led to significant changes in the financing and delivery of telehealth, which may improve access to care for diabetes patients from racial and ethnic minority groups. The Centers for Medicare and Medicaid Services (CMS)—through authority granted by the Coronavirus Aid, Relief, and Economic Security (CARES) Act—now recognizes patients' homes as an originating site, created payment parity with in-person services, and approved the telephone as a tool for conducting patient care [55]. However, these changes are temporary as they are only allowable for the duration of the pandemic. Section 1834(m) of the Social Security Act prohibits the CMS from paying for telehealth services delivered via two-way audio-visual technology unless care is provided at an eligible site in a rural area [49]. As lawmakers debate permanently expanding telehealth coverage, our findings provide evidence demonstrating the potential positive implications for Black and Hispanic patients with diabetes.

Limitations

Our review had some limitations. Notably, interventions in our sample varied in the mode of telehealth, the intensity of contact with patients and health professionals, and the duration of the intervention making it difficult to comment on the specific strategy within these studies that led to improvements in glycemic control. Still, telehealth enables improved access to care (e.g., information, monitoring, counseling) regardless of the mode of delivery. The intensity or frequency of contact with patients across studies was dependent on the strategy, the need of individual patients, and the mode of telehealth. For instance, it is more feasible to have more frequent contact with patients using text-message-based interventions compared to synchronous virtual telehealth visits. Our review included studies that had a substantial representation of Black and Hispanic patients. Some studies had a higher proportion of White participants than others. And a significant portion of the studied we identified had a high risk of bias based on information reported or not reported to make an assessment (i.e., unclear). However, these studies contributed the least weight to our analyses. Our subgroup and sensitivity analyses indicated the magnitude and direction of the effect is the same or similar with these groups combined or separated. A significant strength of this study is our focus on Black and Hispanic patients with diabetes in the context of randomized control trials. Therefore, our findings reflect studies that were able to make causal claims about the impact of telehealth interventions on glycemic control among Black and Hispanic patients.

Conclusions

Telehealth interventions can be effective at improving glycemic control among Black and Hispanic diabetes patients. Most experiments that involve telehealth interventions among Black and Hispanic diabetes patients focused on exploring modes of delivering diabetes self-management education. These interventions are limited because they do not target the many other potential barriers to glycemic control among Black and Hispanic patients. Few studies have primarily aimed to improve glycemic control among Black and Hispanic patients using telehealth interventions. Our findings are relevant to policymakers as they decide whether and how to maintain and expand access to telehealth services. Future research should explore the use of telehealth, beyond knowledge for self-care, to address unique barriers to glycemic control that patients from racial and ethnic minority groups may face.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s40615-021-01174-6.

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The authors are willing to provide additional information on how the analysis was conducted at any time.

Code Availability The authors are able to provide the Stata code that was used to conduct the meta-analysis.

Declarations

Competing Interests The authors declare no competing interests.

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