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Who is using continuous glucose monitoring for type 2 diabetes management? A scoping review protocol

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ABSTRACT

Introduction Equitable access to healthcare technology is a major public health issue. For adults with type 2 diabetes (T2D), continuous glucose monitoring (CGM) technology can improve diabetes self-management and clinical outcomes. Even though CGM is now recommended by professional guidelines for all patients with diabetes on insulin therapy, evidence suggests that CGM is underutilised and inequitably prescribed across health systems. As CGM is an emergent technology, it is vital to understand what approaches have been studied to overcome inequities in CGM access for adults with T2D, what aspects of equitable access have yet to be addressed and what are facilitators and barriers to CGM access at the individual, facility and health system levels.

Methods and analysis We will use the Joanna Briggs Institute's revised scoping review framework to conduct our analysis. The protocol is registered with Open Science Framework (https://osf.io/z2exn). We will search for peer-reviewed literature containing empirical evidence for the facilitators and barriers to equitable access to CGM technology for patients with T2D. Findings will be organised according to research objectives and the Framework for Digital Health Equity, and summarised using narrative synthesis of descriptive statistics for quantitative findings, and themes for qualitative findings. This review will be conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Reviews.

Ethics and dissemination The findings from this review will provide valuable information and support for future research into the equitable implementation and use of CGM for patients with T2D. We will disseminate findings at conferences and publish in a peer-reviewed journal.

Trial registration number https://osf.io/z2exn.

MESH TERMS

Type 2 Diabetes Mellitus, Access, Continuous Glucose Monitoring, Safety-net Providers, Health Equity, Health Services Accessibility, Digital Health, Remote Patient Monitoring

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This review protocol outlines a comprehensive search strategy to understand barriers and facilitators of equitable access to continuous glucose monitoring (CGM) for patients with type 2 diabetes.
⇒ The proposed review will establish an essential knowledge base upon which to develop future interventions to support equitable access to CGM.
⇒ The proposed scoping review will not assess the effectiveness of the interventions or the quality of the included studies, as the objective of the scoping review method is to identify current gaps in knowledge.

INTRODUCTION

Diabetes is a metabolic disorder characterised by chronically high blood glucose levels that cause severe and debilitating conditions if left untreated.[1] Insulin is a hormone that enables cells to use blood glucose for energy, and diabetes can occur if the pancreas does not produce sufficient insulin (type 1) or cells do not use insulin properly to regulate blood glucose levels (type 2).[1] Diabetes impacts 11.6% of Americans, and type 2 diabetes (T2D) accounts for 90–95% of diagnoses.[2] The total estimated cost of treating patients with diabetes in the USA in 2022 was $412.9 billion or roughly 25% of US healthcare dollars,[3] making it the most costly chronic disease in the USA.[4]

Continuous glucose monitoring (CGM) involves wearing a small sensor that takes and transmits regular readings of glucose levels in real time to inform patients, caregivers and clinician decisions about diabetes management.[5] Sensor changes and monitoring of blood glucose levels are managed by the patient and/or caregiver at home. Clinicians can review reports remotely to suggest lifestyle and medication changes. Thus, CGM enables real-time review and informed action by patients to manage glucose levels and provides detailed information for clinicians to evaluate and use to make recommendations. Compared with periodic fingersticks for glucose testing, CGM has been shown to improve glycaemic control,[6–11] reduce

emergency room visits and hospitalisations[12 13] and improve economic outcomes for patients with T2D.[14]

Although CGM has long been approved for patients with type 1 diabetes (T1D), it has only recently become available for an increasing number of patients with T2D,[15–17] and data are still emerging on CGM usage for patients with T2D. For patients with T1D, research has found that use of CGM is lower for groups that have been historically marginalised on the basis of income, education, race, ethnicity, language, rurality and insurance. This disparity in access persists despite evidence of the benefit of CGM across patient groups and support for its use from all major professional societies.[18–21] Literature reviews have highlighted education-related factors, such as patient health literacy, experience with technology and ability to navigate documentation of medical necessity, as being specific challenges preventing equitable CGM implementation.[18 19] Other studies suggest that patients may not be offered CGM due to clinician ignorance or implicit bias that causes them to subconsciously (or consciously) believe that patients from black, Indigenous and people of colour communities are not willing and/or able to engage with CGM technology.[18–22]

Factors including CGM brand and insurance coverage also predict access to CGM. For some patients, the CGM brand is not compatible with their smartphone.[23] Brand of CGM device further drives patient experience, with individuals valuing characteristics such as the method of data retrieval, adhesive durability and sensor wear time.[24] The cost of the technology poses an additional barrier. Medicare part B will pay for CGM devices for all insulin-treated patients with diabetes (both T1D and T2D).[25 26] Medicaid coverage, however, varies widely by state, and coverage is broader for patients with T1D (44 states), as compared with patients with T2D (33 states).[27] Varying insurance coverage and high out-of-pocket costs have resulted in Medicaid-insured patients being two to five times less likely to access CGM.[28]

A critical gap in knowledge about CGM use persists for patients with T2D. T2D disproportionately impacts individuals due to factors related to the neighbourhood and physical environment, rurality, food availability, socioeconomic status (SES) (education, income and occupation)[22 29–31] and access to healthcare.[32–34] Furthermore, characteristics of the healthcare provider-related, setting-related and system-related contexts may also influence equitable CGM access for these groups.[18]

Person-level and facility-level characteristics, in conjunction with structural characteristics, are widely recognised as dimensions of the social determinants of health and a fundamental cause of inequitable health outcomes.[31] The advent of digital health technologies such as CGM has introduced a new dimension of health equity related to access to and experience of digital health tools. These digital determinants of health (DDoH) present at all socio-ecological levels (ie, personal, interpersonal, community and societal) and can include digital literacy, the influence of technology on patient–clinician relationship, broadband access and policies governing the use of health technology.[35] At all levels, the DDoH can have a direct impact on health inequities. Without a deliberate focus on equitable access, new health technologies risk widening disparities between groups.

OBJECTIVE

The goal of this scoping review is to systematically explore the peer-reviewed literature to determine what is known about the facilitators and barriers to equitable access to CGM technology for adult patients with T2D at the patient, facility and health system levels. Consistent with the intent of scoping reviews, our aim is to outline current knowledge, identify gaps in the literature and set forth a research agenda for equitable access of CGM for patients with T2D.

METHODS AND ANALYSIS

Overview

We will conduct the scoping review following Joanna Briggs Institute's (JBI) updated methodological guidance for conducting scoping review[36] which builds upon previous frameworks and aligns with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).[37–39] The JBI framework involves a five-stage process, including the following: (1) identifying the research question, (2) identifying the relevant studies, (3) study selection, (4) presenting the data and (5) collating the results. Consistent with the framework, we will align to the PRISMA-ScR for conducting and reporting on each review stage. Our protocol is registered through Open Science Framework (https://osf.io/z2exn). We will use Covidence and EndNote for tracking literature and conducting screening, data extraction and information synthesis. Study selection is anticipated to start on 1 October 2025 and run through 1 February 2026 (figure 1).

Stage 1: defining the research question

The research questions were developed by following the recommendations of Levac *et al*, to start broadly and then refine while focusing on the review's main purpose.[38] We began by asking, "What aspects of equity have been considered regarding the use of CGM?" An initial exploratory search was conducted in PubMed, which identified several narrative reviews around the use of glucose monitoring technology and equity.[20 21 40] Our searches revealed useful information about common barriers to CGM access, namely (1) patient characteristics (eg, race/ethnicity, SES, health literacy), (2) provider and facility characteristics (eg, provider bias, cost, insurance coverage and reporting requirements) and (3) technological considerations (eg, internet/smartphone access, digital literacy).

The exploratory results also showed that there is considerably more literature on the use of CGM for T1D than for

	Research month									
	1	2	3	4	5	6	7	8	9	10
Stage 1: Identifying research question (complete)	X	X								
Stage 2: Identifying relevant studies (current stage)			X	X	X	X				
Stage 3: Study selection			X	X	X	X	X			
Stage 4: Data extraction						X	X	X		
Stage 5: Collating, summarizing, and reporting results									X	X

Figure 1 Anticipated timeline of research activities.

T2D.[18] While implementation of CGM in the last decade has largely been limited to patients with T1D, advances in CGM technology and recent changes to the Centers for Medicare & Medicaid Services (CMS) coverage policy have greatly expanded the availability of CGM for patients with T2D.[41 42] Considering the lack of literature focused on CGM for patients with T2D and T2D's disproportionate impact on diabetes prevalence and associated healthcare costs,[43] understanding the facilitators and barriers to equitable CGM access for patients with T2D is a timely and important topic.

Hence, this scoping review aims to answer the following questions:

1. With respect to the Framework for Digital Health Equity, what specific aspects of access have been the focus of studies of CGM use among patients with T2D? What aspects have not been addressed?
2. What are barriers and facilitators of CGM access in different T2D care settings (eg, safety net clinics, community health centres)?
3. What access-related outcomes (eg, rates of CGM uptake and continuation, as shaped by digital literacy, implicit technology bias and/or community infrastructure) have and have not been assessed for CGM use at the individual, facility, and system levels?
4. What specific recommendations have been made to increase access to CGM for patients with T2D?

Stage 2: identifying relevant literature

To systematically examine what is known about the equitable use of CGM for patients with T2D, we will conduct a comprehensive review of the existing literature and evidence base. Our search strategy was developed through an iterative process drawing on conceptual frameworks, discussion with team members and exploratory searches of existing literature. We also adhered to JBI guidelines[36] and worked on the search strategy to ensure methodological rigour with a research librarian from our health system in the Department of Veterans Affairs (VA). During development, we used the Framework for Digital Health Equity,[35] an expanded version of the National Institute on Minority Health and Health Disparities Research Framework,[44] to guide our conceptualisation of equitable access as it relates to CGM and inform how we structure data extraction and synthesis. We also conducted preliminary searches to get a sense of the existing literature and identify keywords and phrases to use. After formulating an initial search strategy, we worked with our librarian to test different variations of the strategy by restricting terms to those which appeared anywhere in the article, in the title or abstract or in the title only. The results of these tests were shared with our multidisciplinary team, which includes health services researchers and endocrine clinicians to review and provide feedback. Based on their input, we made revisions and settled on searching titles and abstracts for key terms. The revised search strategy results were reviewed one more time with only minor changes to add additional terms. This series of iterative searches was conducted between 1 May and 30 May 2025. The final search yielded 5551 responses. The final Boolean search string, including keywords, is listed in online supplemental appendix 1.

The final search strategy will be applied to three databases of peer-reviewed journals: PubMed, Embase, and ProQuest Health and Medical Collection. The search strategy for each database is detailed in online supplemental appendix 1. Results from these three databases will be combined, duplicates will be removed, and the remaining articles will be uploaded to Covidence for screening and selection. Covidence is a web-based application that facilitates systematic literature reviews. As a review management software, Covidence organises articles and highlights keywords to make the process of screening articles more efficient.[45] Additional publications may be identified through review of citations used by included studies and will be subject to the same screening and selection process described below. We will keep detailed documentation of our search strategy to ensure that our approach can be replicated. In addition to Covidence, EndNote software will be used to organise and store references.

Stage 3: study selection

The searches conducted on the three databases will exclude any study which is not in the English language or published in a peer-reviewed journal. After duplicates are removed, the results will be uploaded to Covidence for review. Independent reviewers will screen article titles and abstracts for inclusion. An article will be determined to be eligible for the next phase if it (1) includes adult patients with T2D, (2) involves the non-diagnostic use of CGM technology and (3) mentions a determinant

Table 1 Definitions of domains to be extracted

Domain	Definition
Article overview	
Author(s)	Author(s) of the article
Publication year	Article's year of publication
Country	Country of the study team
Objective	Aim of the study
Design	Approach taken by the study to reach its aim
Healthcare context and setting	Clinical, organisational and geographical environment in which the study was conducted
Study/target population	Population to which the study results are meant to be applicable
Sample size	Number of individuals, clinics and/or organisations (depending on the study's focus) involved in the study
Control	Individuals, clinics and/or organisations (depending on the study's focus) used as a baseline against which an intervention's impact was assessed
Outcomes	Clinical (eg, HbA1c control), process (eg, behavioural or management outcomes), experiential, implementation and/or equity-related measurements examined for the sample
Key findings	Main results of the study
Health equity domains adapted from the Framework for Digital Health Equity[35]	
Biological	Biologic predispositions, interactions or factors that influence clinical outcomes among different population groups. This can be vulnerabilities at the individual, interpersonal, community or societal level
Behavioural	Individual and group behaviours and psychological processes affecting health outcomes that occur in response to environmental conditions (eg, exposure to chronic stress, cultural norms for coping with stress or community-level accessibility of resources for managing stress). This may also include societal constructs, policies and laws that permit or discourage particular behaviours that influence health outcomes
Physical/built environment	Conditions or factors related to an individual's community, local, regional and national environment that affect health outcomes
Digital environment	Factors related to the knowledge, use, availability and regulation of internet, digital health devices, platforms and technologies that may have a role in an individual's health outcomes. Includes individual-level and community-level digital health literacy and attitudes around use of internet and technology
Sociocultural environment	Individual or community norms, identities, beliefs, attitudes, values and relationships that may influence health outcomes. Includes factors such as responses to discrimination and structural racism
Healthcare system	Factors related to the structure, function or interaction of the healthcare system with patients, clinicians and communities. This includes insurance coverage for different brands of CGM, quality of care, race-concordant care, and accessibility of services and preference for CGM brands (both for people with disabilities and for people with limited English proficiency and/or health literacy)
Implications	Recommended actions (and of whom—eg, digital healthcare developers and vendors, health systems, health plans, clinical providers, patients/caregivers, patient advocates, community champions, policy makers, public entities) to enhance equity
Other information	
Additional notes	Other information from the article that may be pertinent to this scoping review

CGM, continuous glucose monitoring.

of health equity (eg, digital literacy, SES, community health centre etc.) that can reasonably be linked to the Framework for Digital Health Equity. Non-diagnostic use is defined as the utilisation of CGM for patient self-management of blood glucose levels. The framework provides prominent examples of health equity determinants in each domain and at each level of influence, but it is not intended to be exhaustive so reviewers may have to use their judgement. A full-text review may be required if an abstract is not available, or reviewers are unable to determine if it meets criteria based on title and abstract alone.

These criteria for study selection have been developed a priori and in collaboration with a research team that includes an expert librarian and two endocrine clinicians. Following Polanin *et al*'s guidelines for article screening,[46] all independent reviewers will initially screen the same 25 articles as a pilot test of the criteria, to ensure that the criteria can be applied consistently prior to screening the rest of the articles. Independence of the reviewers will be ensured by assigning articles through the review management software (Covidence), which allows each reviewer to complete their assessments without seeing the others' decisions until they have submitted. Reviewer roles will be filled by members of the study team with applied training and experience in systematic literature reviews, including early-career to mid-career health systems researchers and clinicians with expertise in diabetes management. We will calculate Fleiss' kappa to assess the consistency of inclusion/exclusion determination across the reviewers. We will discuss as a group any inconsistencies and resolve them through consensus, making relevant adjustments to the criteria to help limit such inconsistencies when screening the remaining articles. We will repeat this process of testing and adjusting the criteria on additional batches of 25 articles until the calculated Fleiss' kappa is 0.8 or higher to indicate strong agreement.[46 47] Once the pilot testing is complete, the remaining articles will be screened by one reviewer each. Any article that the reviewers individually deem as needing further discussion will be discussed as a group at regularly occurring team meetings to reach an inclusion/exclusion determination through consensus.

Stage 4: data extraction

The tracking of articles to include in the review, based on title/abstract and full-text screening, will be managed using Covidence. Data extraction from the included articles will be carried out on the Covidence platform, templated to the specific data extraction domains outlined and defined in table 1. The data extraction template, including its domains and definitions, will be tested on a subset of 10 articles and refined based on the results. Each article will be assigned one primary reviewer initiating the data extraction and one secondary reviewer verifying the primary reviewer's extraction and adding further details if appropriate. Different reviewers will serve as primary and secondary reviewers for randomly grouped subsets of the included articles. In cases where the primary and secondary reviewers disagree on the extracted details, a third reviewer will be brought in to help reach a consensus.

Stage 5: collating, summarising and reporting the results

The extracted data will be prepared for presentation using both tabular and narrative formats. The initial analysis will collate extracted data and, as applicable, we will summarise qualitative findings thematically using content analysis. To establish themes, JR, BK and AJL will independently code extracted data to identify inductive codes that surface from the literature. They will meet to discuss codes to iteratively reach a consensus on emergent themes that they will then share with the larger group for further input and refinement.[48] We will further summarise quantitative data using descriptive statistics. Consistent with our guiding framework, we will structure the results of the first research question to align with the matrixed structure of the Framework for Digital Health Equity.[35] To the extent possible, we will situate efforts to address access to CGM for patients with T2D within the framework (ie, digital environment—individual; physical/built environment—community) in order to identify which levels and domains have been the target of existing literature, and which have not yet been addressed.

Patient and public involvement

None.

Anticipated limitations and strengths

To the best of our knowledge, this is the first scoping review to focus on equitable access for CGM use among patients with T2D. This review is timely given CMS' recent expansion of CGM eligibility for patients with T2D treated with insulin. Furthermore, this review focuses on what equity considerations have already been tested and what recommendations have been made for future implementation, thus providing valuable insight into the current state of CGM use for these populations and setting agendas for future research in this space.

This review has limitations. Most notably, peer-reviewed articles published in languages other than English that would otherwise have met criteria will be excluded. This exclusion is necessary because our research team does not have the ability to translate such articles into English. Additionally, as the goal of this scoping review is to report on the dimensions of equity that have already been explored in the literature and to identify gaps for future research, this review will not assess effectiveness. Therefore, we will not evaluate references for methodological quality or risk of bias.

ETHICS AND DISSEMINATION

Ethics approval is not required for this review as no human research participants will be involved. All data will be obtained from publicly available documents only. Findings from this review will be shared through publication in a peer-reviewed journal. The findings may also be presented at local or national conferences to share findings with health services researchers, healthcare decision makers and policy makers. Finally, we will share this information with Veterans belonging to the Veteran Engagement Research Group (VERG) and work with the group to determine how best to communicate our findings through their peer networks that include Veterans with T2D. VERG is an initiative that is based out of the VA Center for Health Optimization and Implementation Research that is designed to engage Veterans and their communities as active participants in research and dissemination.[49]

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